JUNE 1965 35 CENTS

Popular Science

Monthly

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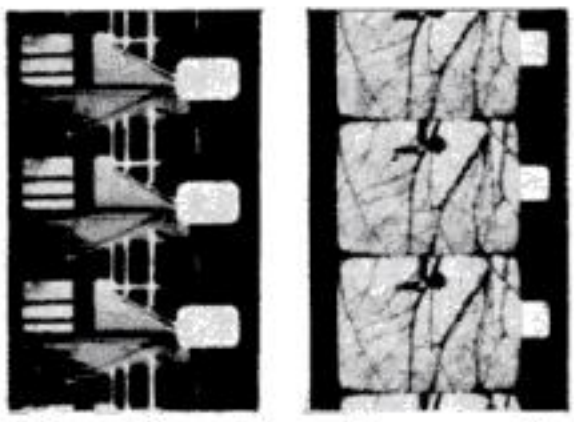
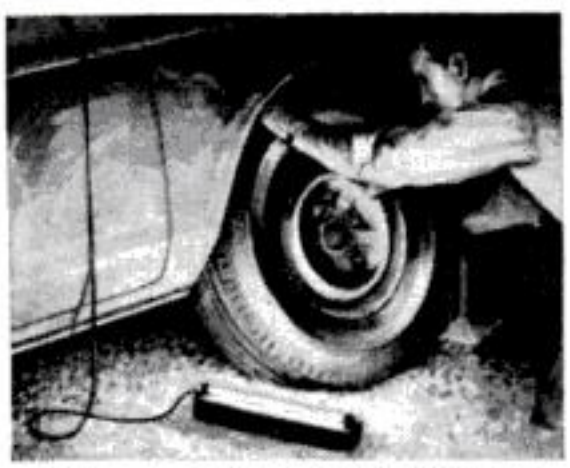
June 1965



New 8mm film: bigger and brighter images. Page 50.

Forget the welding! This patio set bolts together. Page 122.



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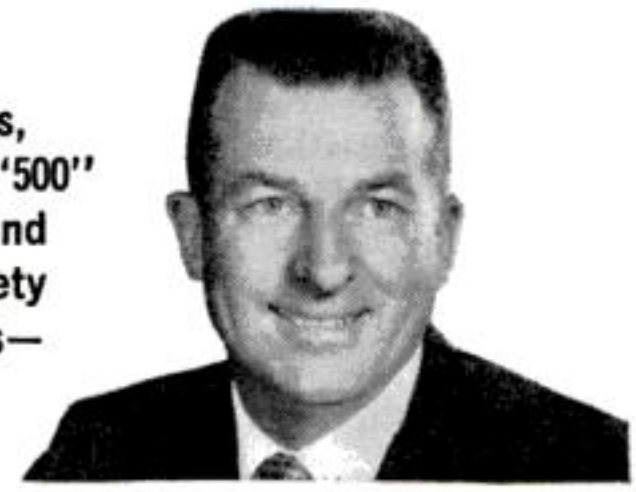
Sam Hanks, Indianapolis "500" champion and driving safety expert says—



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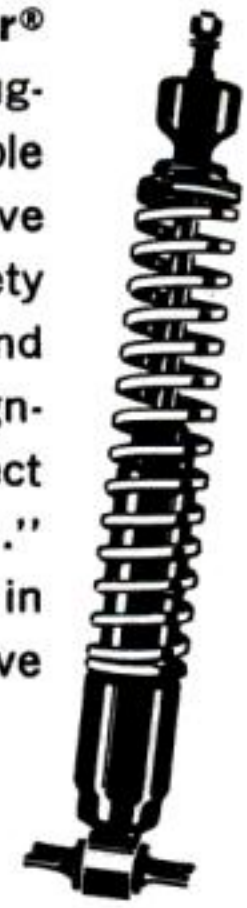

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- **Sneak Preview of the '66 Cars.** A confidential look behind the scenes at next fall's new-car crop.
- **A Space-Age Engine You Can Build.** Step-by-step instructions for a hot-air engine that will run right in your own back yard—on sun power.
- **How to Add an Outlet.** Here's how to have juice where you need it. First of a PS series on improving your home wiring.
- **Civilized Cycles: Everybody Rides 'Em Now.** A lot of people are discovering the fun—and practicality—of a two-wheeled "second car."
- **Tricks with Boat Trailers.** Does yours have a mind of its own when it should follow you like a well-trained pup? Here's how to bring it to heel.

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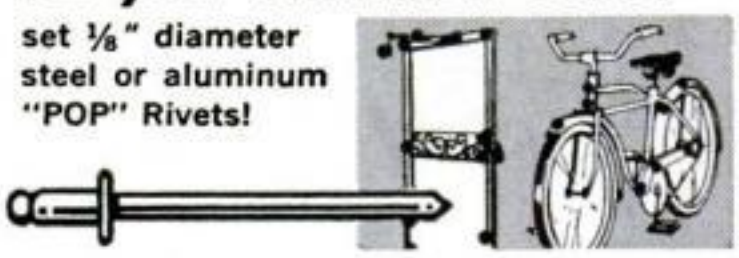

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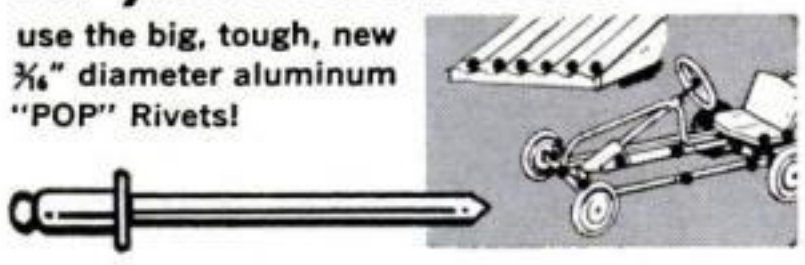

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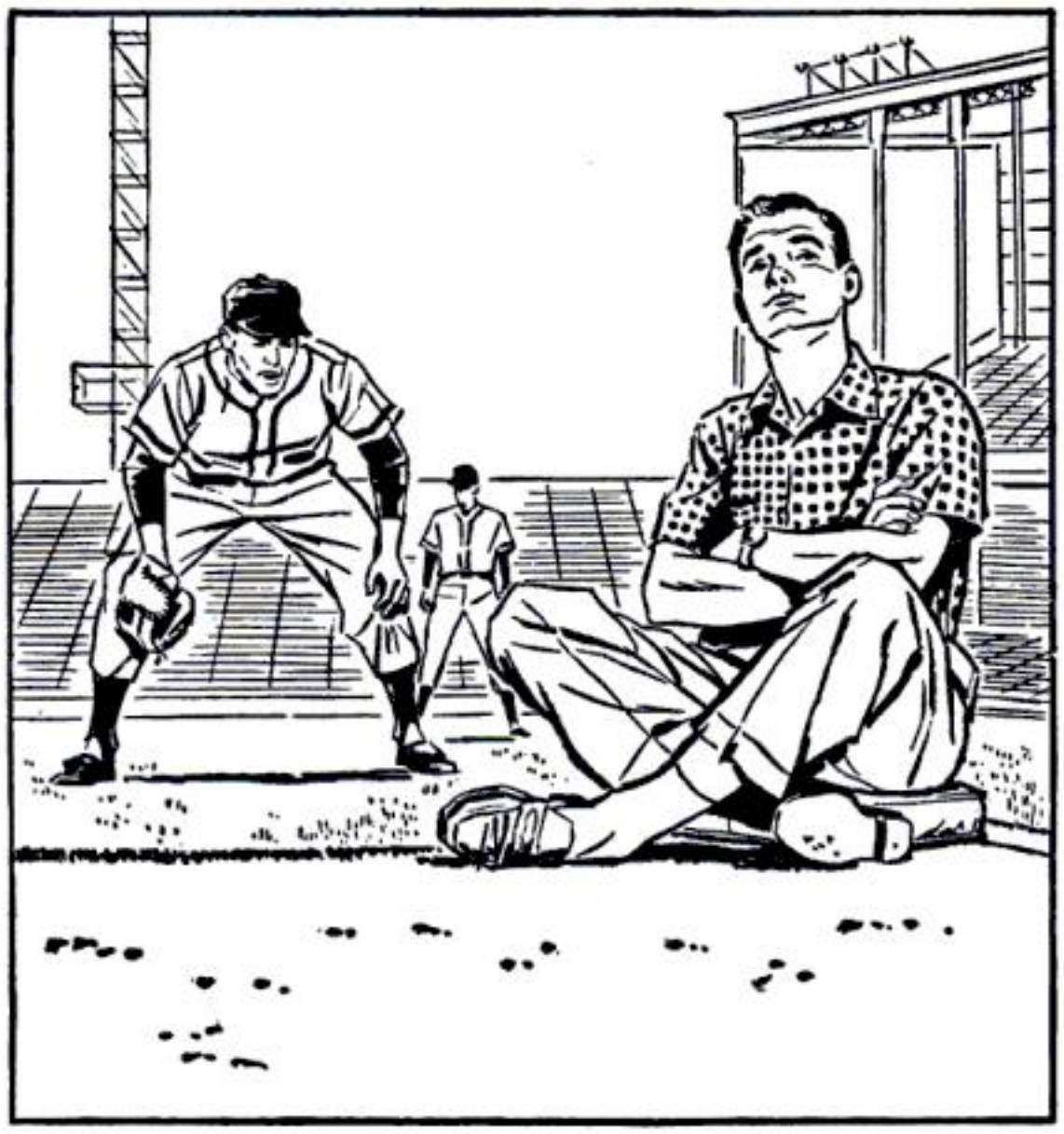

Ever see a man get to first base in his job and then "die"?

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For Better or Worse . . .

Congratulations on your fine approach to the practical aspects of the new cars. Statistics and technical data are necessary guides for auto purchasers, but riding and handling and practical conveniences are paramount considerations. Your "Reports from the Driver's Seat" cover the fundamental points that should be the real bones of contention when a buyer is choosing the "better third" that he has to live with for some years.

J. L. Anderson, E. Peoria, Ill.

Model Garage in Ohio?

One of Gus's experiences ["Gus Puts a Gas-Eater on a Diet," Jan.] interested me because it matched mine:

When new, my '62 Chevrolet six was doing 10 m.p.g. and the dealer couldn't locate the trouble. I left on a 14,000-mile trip and all across country stopped at dealers. One advanced the spark—which made the motor knock. One lowered the float—n.g. One tuned the motor—no improvement. Two said nothing could be done.

Back home, I took it to a testing clinic—they suggested new points. I then took the car to another outfit that found the trouble in 15 minutes. When they fixed it, the pointer on the exhaust-gas analyzer moved from extreme rich

to extreme lean. The culprit was the same one Gus uncovered—an upside-down throttle-body gasket.

Allan Swanson, Youngstown, Ohio.

Cleaner, Neater, Easier

Rather than mess with all the requirements of your method of refilling ink cartridges ["Short Cuts and Tips," Apr. p. 144], I use a hypodermic syringe. With the needle removed, I fill the container by pulling back on the plunger, then reassemble the needle, insert it in the cartridge and refill it. This is a perfect method—clean, easy to do, and a bottle of ink goes a long way with no waste.

E. L. Odoms, Milton-Freewater, Ore.

The Warren Report

One "scientific fact" hard to swallow: If the President was hit in the back of the neck with a bullet having enough force to penetrate his body and the Governor's, and to split into fragments to be picked up off the floor of the car—then why did not the President pitch forward at the impact instead of clutching his throat "as if hit from the front," snapping his head backward, and falling backward and to his left?

Point Two: The Warren Commission states "Oswald was kneeling in the window, partially covered by boxes." How could a witness accurately identify Oswald (height, weight, color, hairline) from six stories down and across the street? Why didn't the policeman to whom Oswald was reported immediately seal off the building? Why the 25-minute delay?

This case is important enough not to relegate the third bullet to a "mystery realm." How do we reconcile the Governor's statement that he'd turned to his right *after* the first shot, and when he could not see the President slumped to his left, he then turned to his left, and that was when he himself was hit (pages 49 and 50 of the Report)?

W. C. Melkonian, Brooklyn, N.Y.

Preparing for a Big Blow

Regarding tie-down cables for trailers ["I'd Like to See Them Make," Mar.]: I anchored a 24-foot trailer where wind is clocked at 75 to 80 miles an hour at times. I got four anchors from the telephone company. I wound ¾-inch cable around the trailer's frame, set the anchors in the ground three feet deep, and connected the cables to them as tight as possible. You couldn't tip over the trailer with a tractor; and the cables are not in the way when you're walking around it.

Carl Laumeister, Rome, N.Y.

Nothing New Under the Sun

A few days after reading about the "amazing revolutionary new oil filter" ["50,000 Miles Without an Oil Change," Mar.] I ran across a

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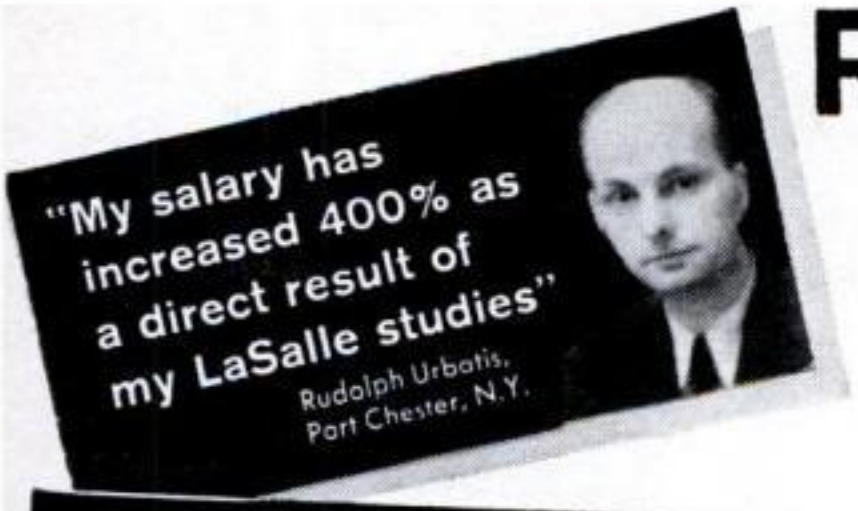
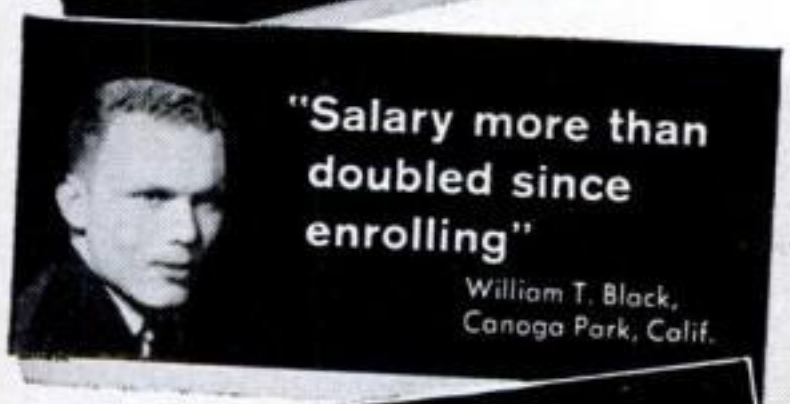
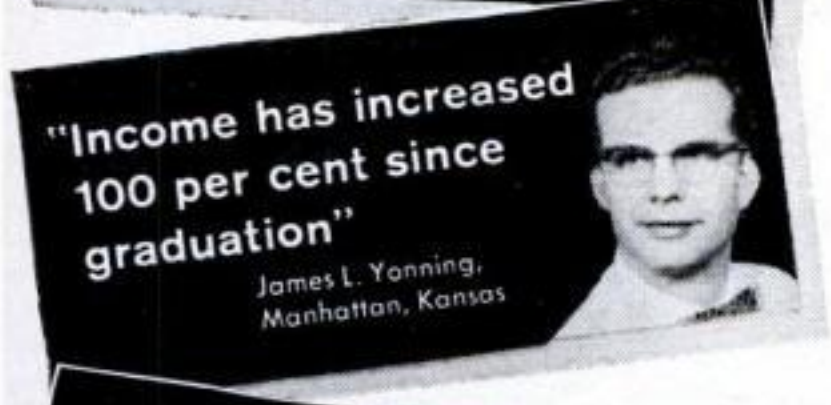
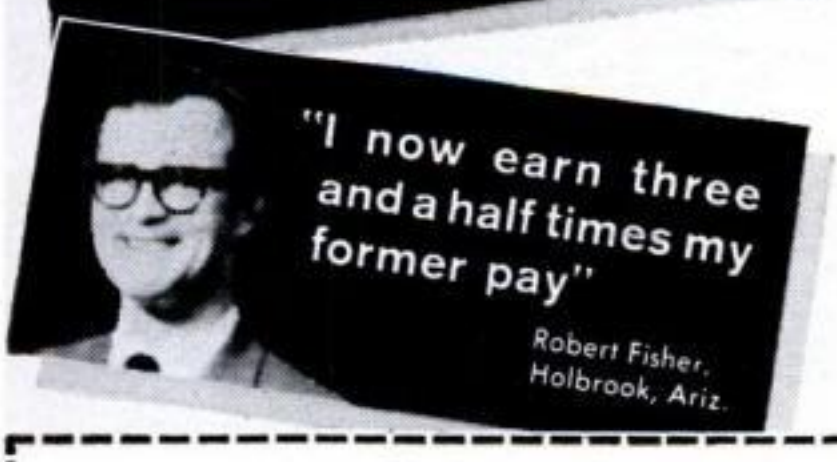
WHO ELSE WANTS A BIG RAISE IN PAY?









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El Camino

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CHEVROLET

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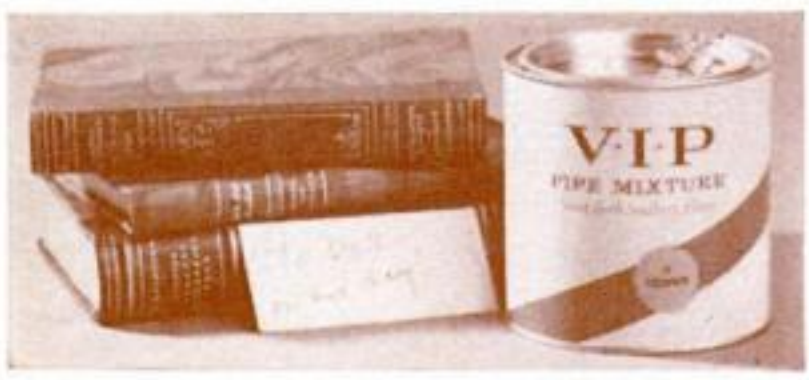

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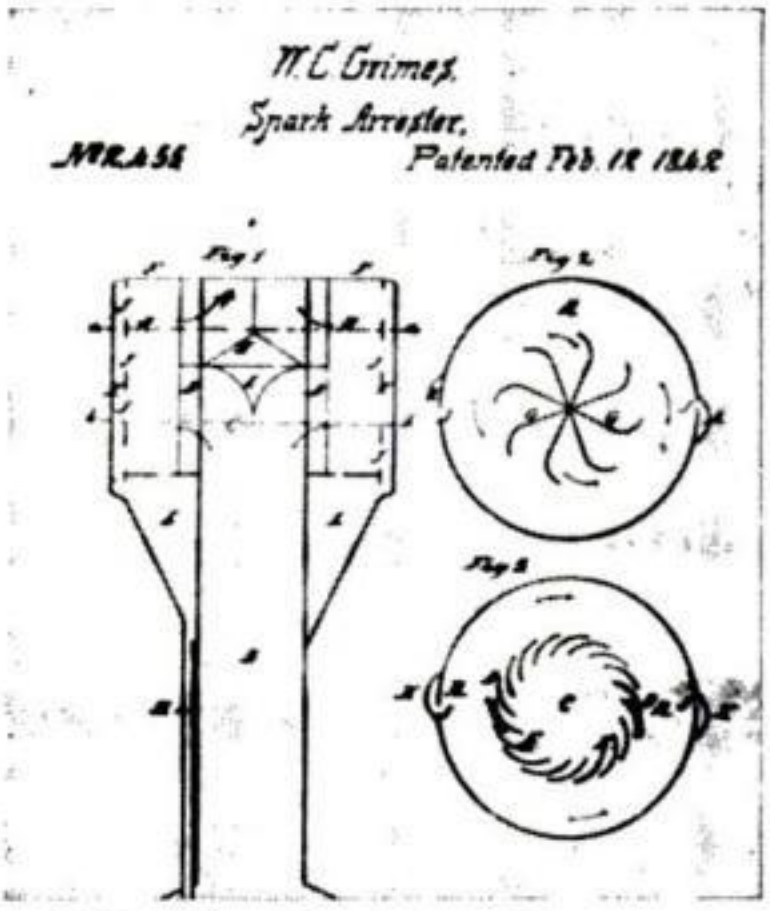
FROM THE HOUSE OF Edgeworth

PS readers talk back continued

U.S. patent dated 1842 (#2,455, issued to W. C. Grimes) which describes a very similar device used to filter sparks and burning embers from the chimney smoke of wood-burning locomotives of that day. The rising chimney gases are deflected sideways through curved slots which create a swirling of the gas in an outer chamber. The embers, heavier than gases, are thrown out through the slots and fall into the lower chambers. The filtered chimney gas continues upward through plates and on out of the chimney. The Grimes device needs no rotor. The kinetic energy of the gases creates sufficient centrifugal force to achieve the desired filtering.



As a patent attorney, I've long since concluded that there's not much new under the sun—or under the hood either.

GORDON W. KERR, Spring Lake, N.J.

You Can't Hit 'Em All

Readers of "Shopping for a Riding Mower" [Apr.] will want to know that we make three such mowers—the Emperor IV tractor ($255 FOB Wis.), the Emperor VI ($325), and the Emperor VI Deluxe ($375).

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J. J. YOUNGWORTH
Ariens Co., Brillion, Wis.

. . . You neglected to mention the mowers made by the National Mower Co., St. Paul, Minn. You'll not find better-built riders at any price. Mine serves me as a light tractor, too.

T. W. LEVERETT, Poughkeepsie, N.Y.

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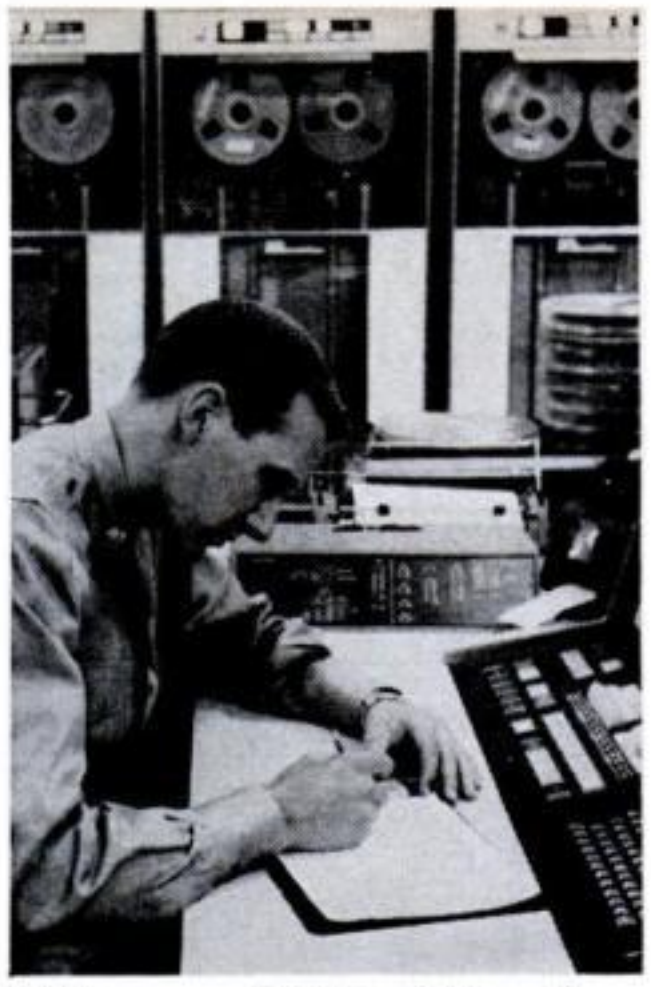

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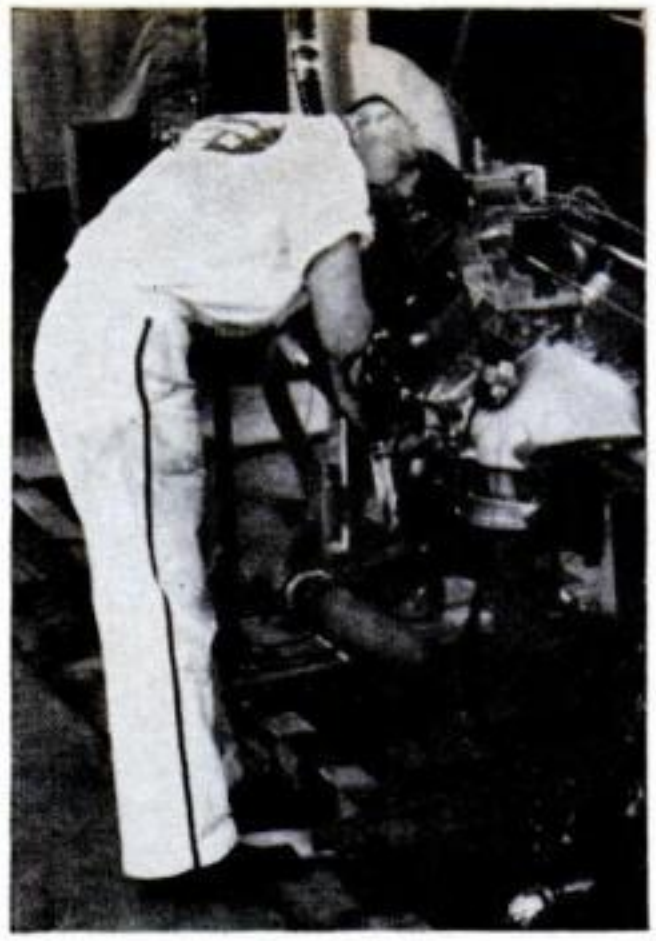
'Say, Smokey–'

A clinic on cars by America's most famous mechanic



EACH month in POPULAR SCIENCE, Smokey Yunick will answer questions on cars—family cars, high-performance jobs, hot rods, and racing cars—selected from those sent in by readers. Got a problem? Ask Smokey. You'll find the address at the end of the column. Please *print* your name and address.

►***"Ever since my '64 Corvair Spyder was new, it has shuddered when the clutch is released, especially in reverse when on a slight incline. It has been set to specs in the repair manual but the shudder continues. Can you help?"—Thomas Hays, Santa Anna, Tex.***

The cause could be a transmission slightly out of line with the clutch assembly, pressure-plate adjustment out, or contamination of the plate with oil, water, or grease. Also, the engine and transmission mount must be right.

►***"Going up a medium grade in my '58 Pontiac V-8, I find my engine cutting out between 35 and 40 m.p.h. As soon as the speed drops back to 30, it cuts in again. The carburetor is in top condition. What gives?"—Ron Anstey, Vancouver, B.C.***

Remove or replace the fuel filter and your car will climb those hills with no trouble.

►***"Is there an easy way to get more power in my 1961 stick-shift Ford Falcon six?" —Mike Warner, Pasadena, Calif.***

No. It would help some to shave the head for increased compression, install a performance cam, and put in better manifolding. The sure way would be to have a new Ford 289-inch engine installed.

►***"I had a valve job at 4,000 and another at 26,000 miles on my '62 GMC Model 1000 pickup. At the last one, the carbon was a half-inch thick on the intake valves. The agency had told me this truck should go 100,000 miles between valve grindings. Now they have no solution for my troubles." —Claude Holland, Redding, Calif.***

Too much oil flowing down the valve guides could cause this. GMC has a kit to correct it. It could be caused by a poor break-in with regular oil and additives on the extra-hard block and rings. If the latter, only an engine tear-down, removing glaze from the cylinder walls, a new set of rings, and proper break-in will cure it.

►***"Driving on a long upgrade in my '62 Dodge Dart 6 with a 225-inch engine and automatic box, I maintained a speed of 60 m.p.h. Manifold pressure dropped to zero, though the throttle wasn't floorboarded. My engine turned 2,600 r.p.m. Using second gear on the same grade, same speed, the vacuum gauge read between six and seven inches, and the r.p.m. 3,300. Was I using more gas in high gear at zero vacuum, or in second with six to seven inches?"—Jim Slepin, Morehead City, N.C.***

In second. With even six inches of manifold vacuum, the power valve is open, and at 3,300 the engine draws more fuel than at 2,600 revolutions.

►***"I bought a used 1960 Chevy Impala with automatic shift, power steering, and Positraction—mileage, 36,000. Over 55 m.p.h. there's a bad vibration similar to wheels out of balance, or shimmy. New tires have been balanced, universals re-***

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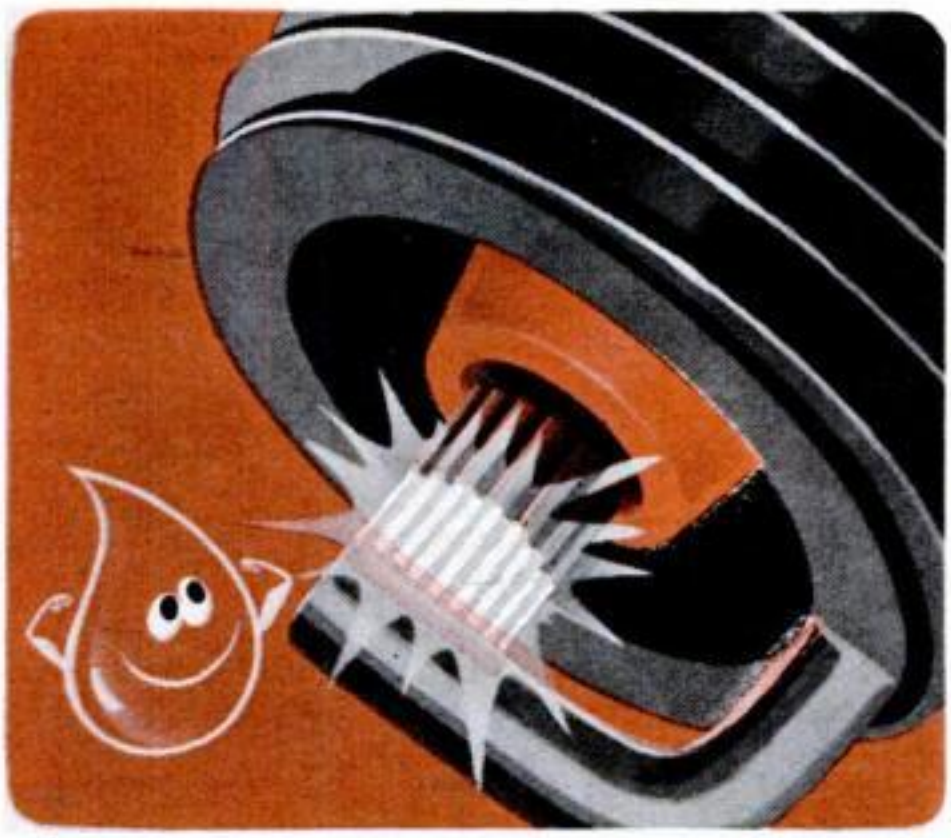
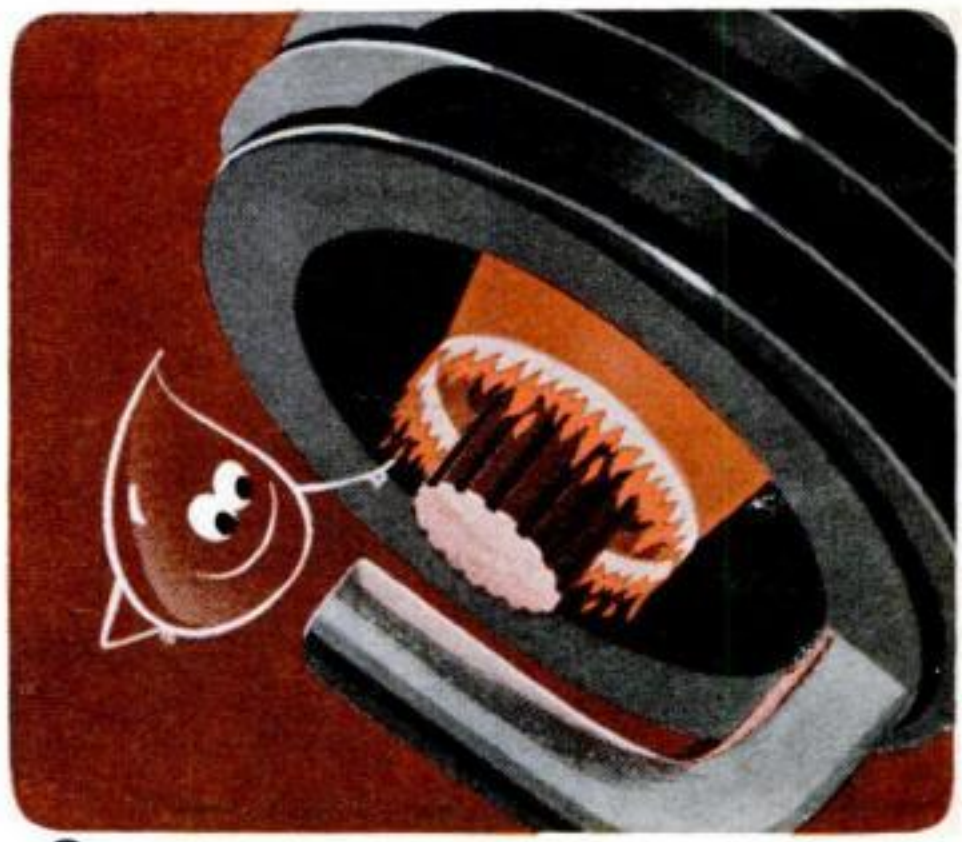
How AC Fire-Ring Spark Plugs clean themselves – help boost engine power



1 As the AC Spark Plug fires, it cleans itself, helps deliver maximum power from each drop of gasoline.



2 During combustion, the intense heat of AC's exclusive Hot Tip Insulator burns away fouling deposits.

3 AC's cleaner tip helps maintain full power longer, helps promote better mileage from your car.

4 AC's self-cleaning action helps boost power and performance. Specify AC Spark Plugs when you change.

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

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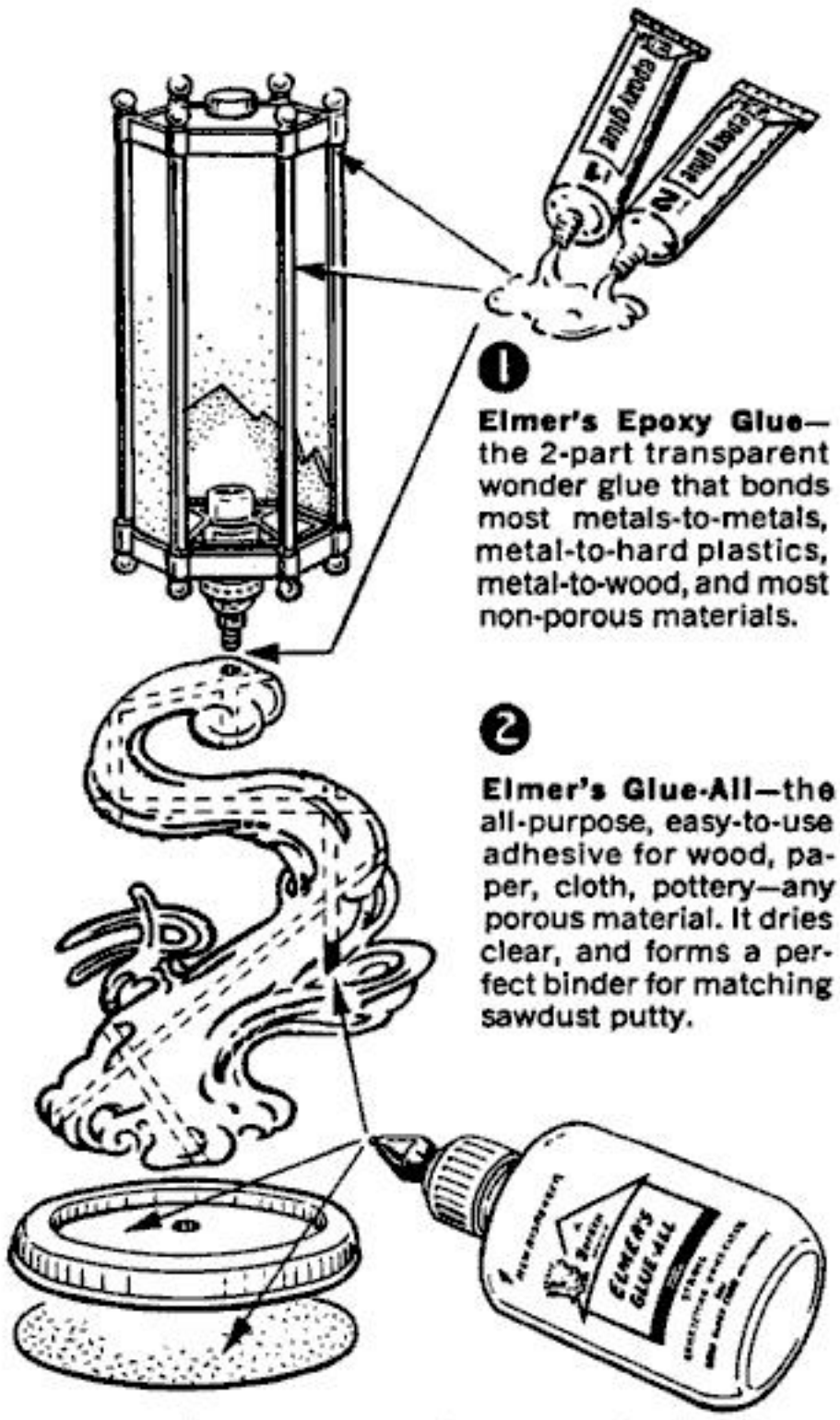
Elmer's has the right glue for every job you do



❶ **Elmer's Epoxy Glue**—the 2-part transparent wonder glue that bonds most metals-to-metals, metal-to-hard plastics, metal-to-wood, and most non-porous materials.

❷ **Elmer's Glue-All**—the all-purpose, easy-to-use adhesive for wood, paper, cloth, pottery—any porous material. It dries clear, and forms a perfect binder for matching sawdust putty.

Here's a job that requires two kinds of glue. Making this attractive driftwood lamp is quick and easy when you use *both* Elmer's Epoxy Glue and Elmer's Glue-All. To make the shade (metal-to-metal, metal-to-plastic and metal-to-wood), take a few square feet of hard plastic, six shortened curtain rods, a bit of channel brass, and use Elmer's Epoxy Glue. For the base assembly (wood-to-wood and wood-to-felt), use Elmer's Glue-All. Then plug the holes for the lamp cord with a putty made of sawdust and Elmer's Glue-All. That's all! For additional crafts tips, send for FREE copies of "Elmer's Wood-Gluing Handbook" and "Working With Elmer's Epoxy". Write: The Borden Chemical Co., 350 Madison Avenue, N.Y., N.Y. 10017. (Available in Canada).

THE BORDEN CHEMICAL COMPANY

Smokey Yunick continued

placed, and engine mounts checked. Also, is limited-slip differential the same as Positraction?"—Oliver E. Perry, Unionville, Conn.

Check through the following: all wheel bearings; drive shaft for being bent or out of alignment; looseness or worn bushings in radius rods to rear housing brackets, or any other cause of the rear axle being out of line. If all this checks okay, you'll probably find your vibration in the engine. Find your r.p.m. at 55 m.p.h. You may be able to rent or borrow a portable tach for this. Next, with the car parked and out of gear, run the engine at the same r.p.m. and see if it vibrates. One more thing can make a car vibrate badly—tires out of round, though balanced. Positraction is the same as limited-slip.

►***"How tough are the old ('32 to '40) Ford transmissions? I want to hook up a 195-hp. Chevy 283 to a '39 Ford box for street use only. Would the old box take it?"—Arlan Shaffer, Ventura, Iowa.***

The '39 Ford transmission was very good—for the car for which it was designed. That car did not weigh over 3,000 pounds, and it held an engine of about 85 hp. Sounds like you want to double the hp. to that old box and push a heavier car with it. Don't do it unless you have a very light chassis—and then drive reasonably.

►***"My '58 Chevy six engine has had everything from bearings to rocker-arm shaft replaced, including the valve lifters. Though very quiet around the city, the lifters get very noisy after 10 minutes of highway speeds. They go back to normal quiet with slow driving. What's the solution?"—Saverio Guerrera, Toronto, Can.***

The lifters could be starving for oil. Did the mechanic who replaced them use the right model? Small changes are made from time to time. If they're right and installed correctly, you will find the trouble in the oil system. When the engine is revved up, as for highway speeds, the oil has the pressure, but not the volume, to feed the lifters. Find the restriction, clear it, and the noise will stop.

►***"Going up a steep hill in high gear, my '62 Comet with standard transmission slows***

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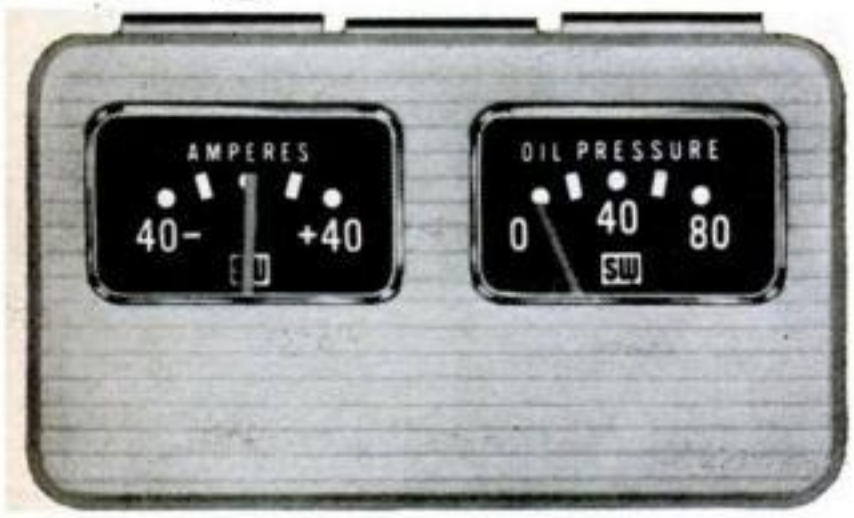

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Smokey Yunick continued

down a little when I floorboard the throttle. If I let up on it about halfway, the car picks up speed. New plugs and points, and timing set to factory specs, didn't help. What do you say?"—Leon Gross, Philadelphia.

This car, for its weight, has a high gear ratio against low torque. At wide-open throttle, the carburetor air velocity goes 'way down, so there is a power loss. When you back off a little, the plate begins to close, cutting the volume and increasing the velocity of the mix, thus delivering more power.

►***"The engine in my '57 V-8 Chevy wagon gave no trouble for the first 115,000 miles. Then I had to replace the head gasket on one side and a burned valve on the other. Now she uses a lot of oil. What are your suggestions for getting more good miles?" —R. Dawson, Chapel Hill, N.C.***

After that many, you've had about all the good miles. Pull your engine, rebuild it to factory specifications, and it will run like new again.

►***"Almost from new, the floor-shift lever on my '63 Hillman 1600 has been stiff, particularly with the car warmed up. The clutch has released with hesitation and jerkiness since 6,000 miles. The car shakes even when XL gear is used. I've installed new master and slave cylinders, blown out connecting lines, and checked for oil leakage from engine and transmission. Found no oil in the bell housing. Engine mounts are okay. What next?"—George R. Smith, Jersey City, N.J.***

The stiff shift could be caused by too heavy transmission oil. If not that, check the linkage, and the bushings that actuate the shift, for tightness and binding between surfaces. Your clutch trouble could come from the throw-out bearing binding on its operating mechanism. If that's okay, check for correct pressure of the pressure plate. Also, make certain the disk itself is not burned out or contaminated.

Got a question on autos? Send it to:
"Say, Smokey—" POPULAR SCIENCE
355 Lexington Ave., New York, N.Y. 10017.
Not every question may be used. Questions cannot be answered by individual letters.

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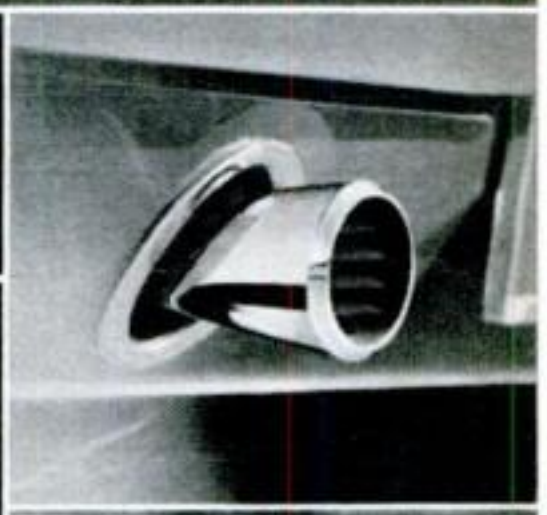
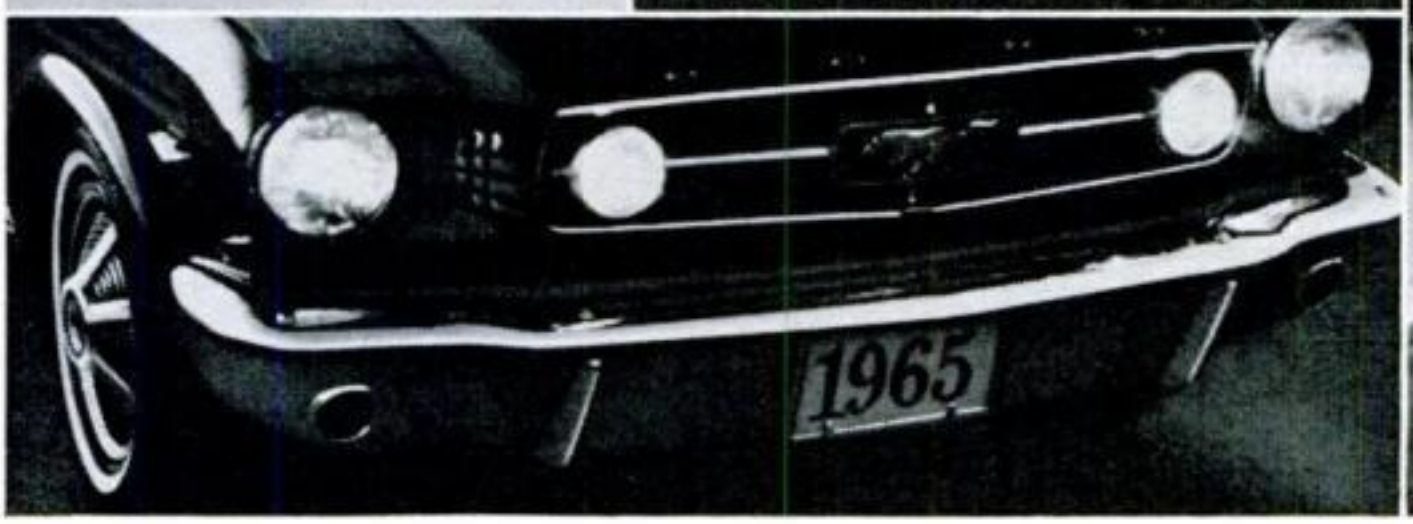
RIDE WALT DISNEY'S MAGIC SKYWAY AT THE FORD MOTOR COMPANY PAVILION, NEW YORK WORLD'S FAIR





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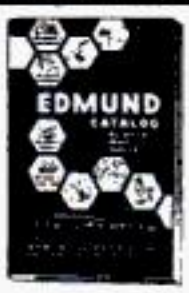

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SCIENCE *Newsfront*

BY WALLACE CLOUD, PS SCIENCE EDITOR

Are the Chinese Reds pushing narcotics?

United Nations narcotics experts are skeptical of Russian charges that Communist China has increased illicit opium sales in order to finance propaganda. *Pravda* said the Chinese have increased narcotics sales from $70 million to $500 million a year in the last 12 years. UN sources say illegal opium production has risen to 1,000 tons a year, but that most of it is grown in southeast Asia. About the same amount is produced legally for medical use—67 percent in India, 21 percent in Turkey, and 10 percent in Russia.

Spaceman's shell

Resembling a phone booth in space, this work capsule proposed by the Chrysler Corp. would enable space mechanics to get away from intense solar radiation and pesky micrometeorites. Built-in hydrogen peroxide rockets would enable the capsule to scoot around freely. Telescoping arms extending from the capsule would cling to a spacecraft by means of adhesive pads. If the astronaut's space suit sprang a leak, the capsule would be sealed and pressurized so the spaceman could scoot back to his spaceship.

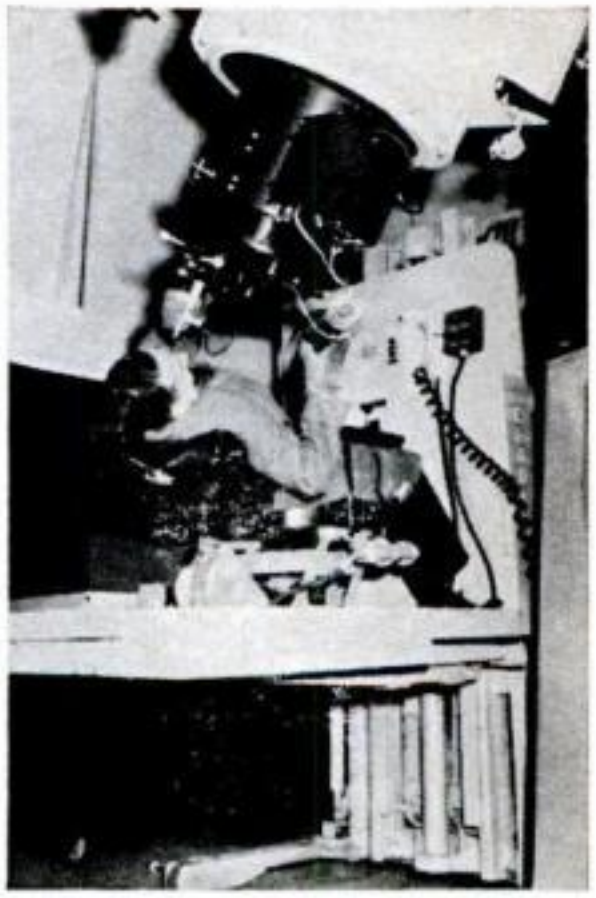
Plug-in rat

Brain-mapping is such a growing field of research that one manufacturer, Amphenol-Borg Electronics, has now seen fit to bring out a line of standard connectors

for plugging in laboratory animals. One is modeled by the rat in the photo. Tiny wires are inserted into the animal's brain, and a socket is securely fastened to its skull. The animal moves about freely without discomfort, and leads can be plugged in conveniently to test the effects of small electric currents on selected areas of the brain, or to record brain waves.

Hovering astronomer

A solution to the astronomer's problem of staying with his telescope as it moves to track stars across the sky has been provided by the Clark Equipment Co., a firm



that makes industrial load-handling equipment. The astronomer's chair glides on an air cushion flowing from its base, atop a platform that moves up and down on an electric lift truck. The stargazer, photographed at Mt. Cuba Astronomical Observatory, Wilmington, Del., was wearing his coat and gloves because it was cold inside the open telescope dome.

Flash of light may be next insecticide

Insects have been killed or made sterile by flashes of high-intensity light from an ordinary photoflash tube, in experiments by Dr. D. F. Riordan of the Canadian Department of Agriculture. Object of the research is to develop a safe method of bug control.

The light affects males primarily. A single flash killed 26 percent of male mosquitoes, and all the survivors were sterile. In an

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Science newsfront continued

experiment with a species of small parasitic flies, one flash sterilized 87 percent of the male flies, while two flashes either killed the flies or left them sterile.

Either way, affected males are unable to fertilize the eggs of female insects; on a large scale, this could reduce the population drastically.

Sterilization by gamma rays (a type of radiation emitted by radioactive elements) has been used successfully against some insects, but the flash technique would be considerably safer and might be easy to use on a wide scale.

Sun winds are measured by radar

The velocity of the "solar wind" has been measured by MIT scientists who bounced radar waves off the sun. It's streaming from the sun's surface at 2,200 m.p.h.

The solar wind consists of plasma—a mixture of electrically charged fragments of atoms—ejected into space by the thermonuclear explosions that are continually taking place all over the sun.

About 600 radar observations of the sun have been made by the group from MIT's Lincoln Laboratory, using a powerful radar transmitter at El Campo, Tex. The radar waves don't reach the light-producing surface of the sun, but are reflected by the corona, the outermost region of the solar atmosphere. Thus, as a radar target, the sun has up to 10 times the area of the disk we see.

The speed at which the plasma is moving toward us was determined by measuring the Doppler effect—the shift in frequency of the radar waves that takes place when the waves are compressed by their encounter with moving particles.

The man who was allergic to Glenn Miller

The man in the doctor's office said he sometimes had an epileptic fit when he heard music. "Aha," thought Dr. Francis M. Forster of the University of Wisconsin epilepsy center, "a rare case of musicogenic epilepsy!" What kind of music triggered the seizures? The man didn't know.

Dr. Forster began tracking down the musical culprit. He and his patient listened to over 100 hours of records, ranging from chamber music to rhythm 'n blues.

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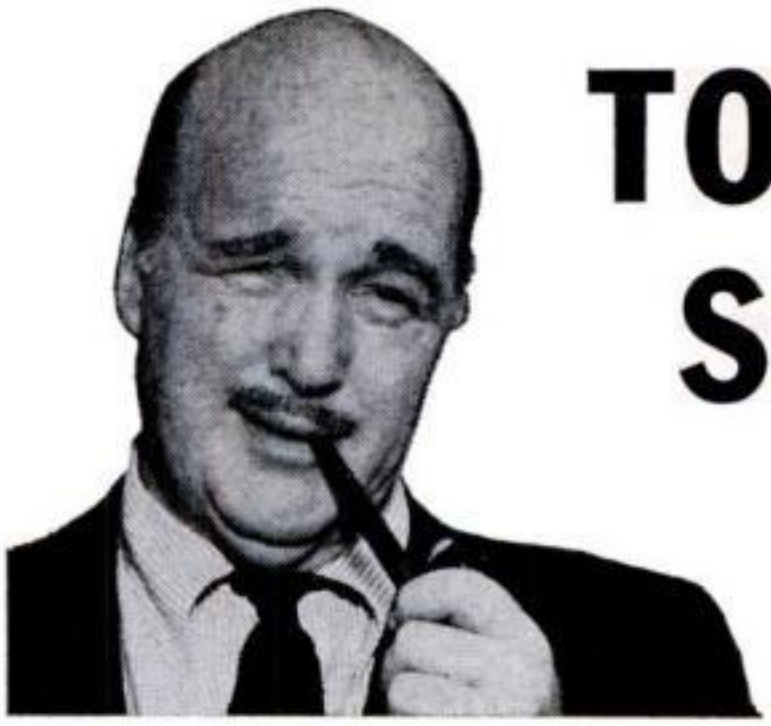

TOM McCAHILL SOUNDS OFF ON JOBS

The trouble with too many people today is they want to start "on the job" as Executive Vice President—and work their way up.

This is fine. But, with the exception of banks, there just aren't enough VP jobs to go around. So the years tick away in a dead end job, looking for that pot of gold that's already dried up. And the worst part is—there's no middleman profit after the bills are paid every month.

If there's any field today where the average guy can make real money, it's the service business. If you can provide a service that people need, do the job right and show some old-fashioned honesty, you've got it made.
For instance.

This is the age of automation. You don't rub sticks together any more to fry bacon. Just toss it in a time and temperature controlled frypan and read the paper. Some of the kids nowadays wouldn't know how to wash a dish. They stack 'em in the dishwasher and knee the door shut. Most people think a scrub board is a thing for making music. They watch TV while two cents worth of electricity washes, rinses, spins and dries the duds.

A house just isn't a home unless it's loaded with automatic gadgets. And it's pretty easy living until something breaks down. Here's a spot where the guy who can fix today's electrical appliances can make himself a mint of money.

How does anybody get into this field? It's easier than you think. The Appliance Division of the National Radio Institute in Washington, D. C., has a unique and downright interesting home-study course that shows how to fix almost anything the way the pros do it. It covers appliances large and small, air conditioning, refrigeration, and they even toss in small gasoline engine repair for good measure—and earning power.

NRI is one of the biggest and best home-study schools in the country today. Their reputation is tops. After 50 years in the teaching business, they make learning as close to being fun as anything you've tackled. Best of all, this kind of training costs a lot less than you think.

If you're looking for a job with a solid future or want to pick up some cash in your spare time, take a look at the opportunities in this appliance repair business. NRI sends you a free book that tells all about it (and no salesman banging on the door).

The appliance field might not make you an Executive Vice President. But you could wind up with a bankroll as big as most VP's I've met—and as a bonus—no ulcers.

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Finally the patient reacted—to the "big-band sound" of the 1930s and 40s. A Glenn Miller recording of *Stardust* sent him into convulsions for 20 minutes. When Dr. Forster played the same tune on the piano or organ, there was no reaction.

The next step was "deconditioning." Dr. Forster made a tape consisting of 98 bars of *Stardust* played on the organ and two bars of the Glenn Miller version. When the patient could listen to this, the Miller segment was lengthened until he was able to tolerate the entire recording.

To reduce his less-severe reactions to other music, a composite tape was made from a large number of instrumental and vocal recordings, including *Stardust* versions by George Shearing and Hoagy Carmichael as well as Glenn Miller.

After more than 350 hours of musical therapy, the patient was discharged. He no longer reacts convulsively to "big-band" music—as long as he plays the composite tape at home for two hours every day.

Hungry fish help keep Britain's light bulbs burning

Vegetarian fish (15,000 of them) are employed by the Central Electricity Generating Board of England to help generate electricity.

Called grass carp, they have been induced to inhabit Cavendish Dock, a body of water that supplies cooling water to a power plant, to eat weeds that threaten to clog the water inlets.

The young fish, about 2½ inches long, were flown from Hong Kong in 60 plastic bags. They are reportedly making gluttons of themselves, and are expected to weigh 70 pounds full grown.

Similar fish flown from Malaysia are being tested in the U.S. as a possible solution to the aquatic weed problem at Stuttgart, Ark.

Now it's smellprints

Researchers at the Illinois Institute of Technology are working on a method of identifying people by chemical analysis of their "olfactory fingerprints"—the blend of smells that is unique for each individual. Smellprints may be useful in crime detection, the scientists think, and may also be helpful in diagnosing diseases. ■■

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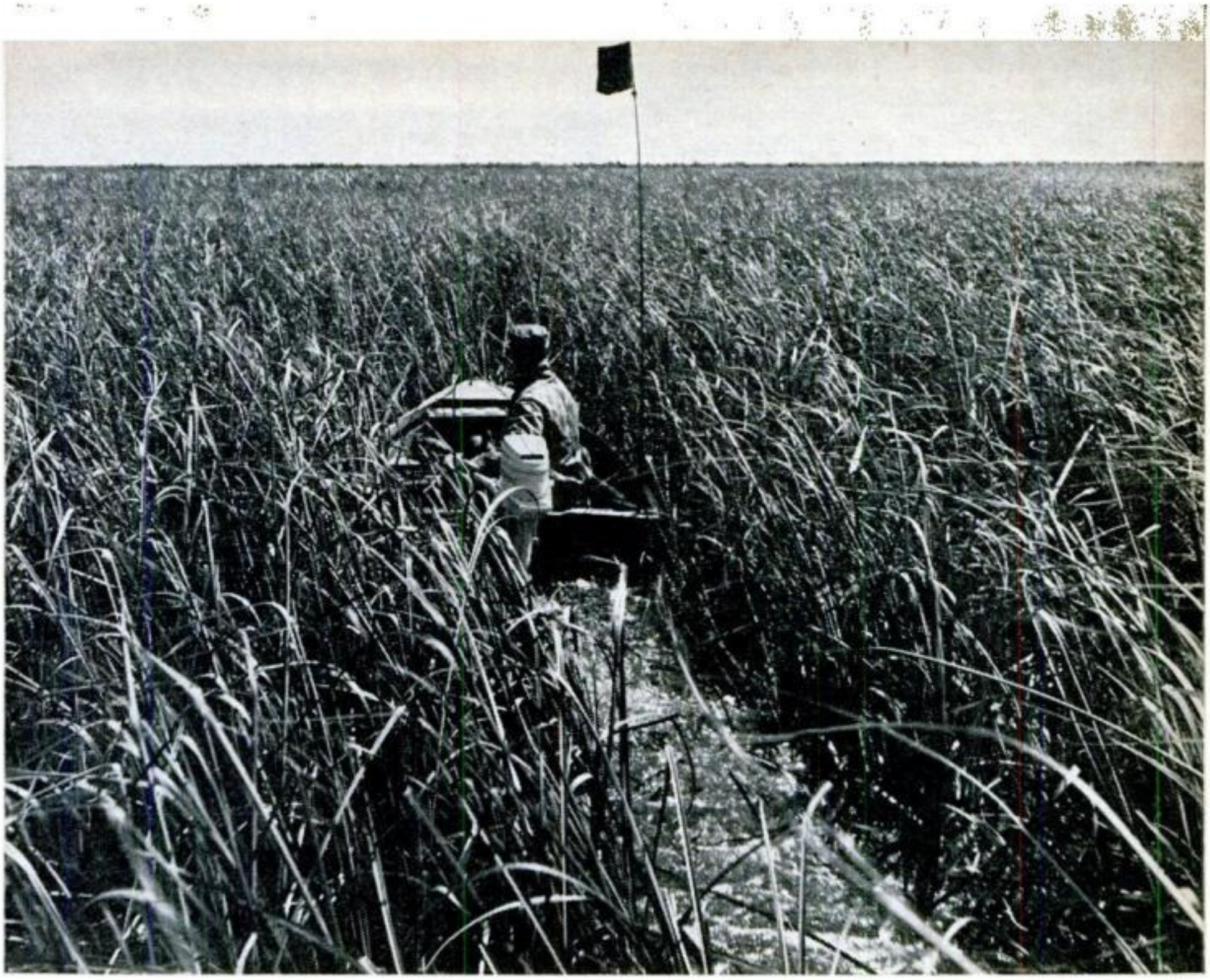

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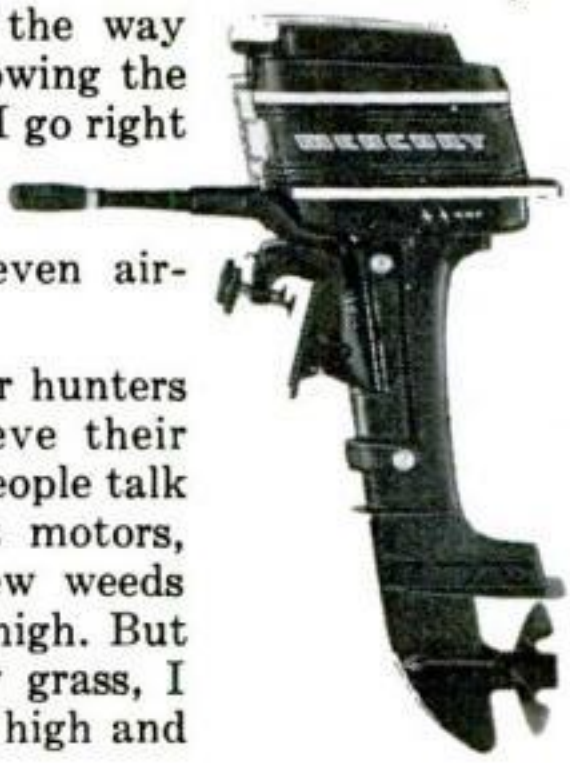

"Whenever I've taken other hunters with me, they can't believe their eyes. You see, when most people talk about weeds and weedless motors, they're talking about a few weeds that stick up about a foot high. But when I say weeds and saw grass, I mean grass four to six feet high and so thick you can't see a foot through it. As you go through, it closes up behind. If your motor ever stopped you could never row or push your boat through.

"During the summer I go back in the glades every weekend fishing for bass. In five years of year-round use my Merc has never been overhauled. You'll hardly believe it till you see it, but if anybody wants to write to me I'll be happy to tell them about it."

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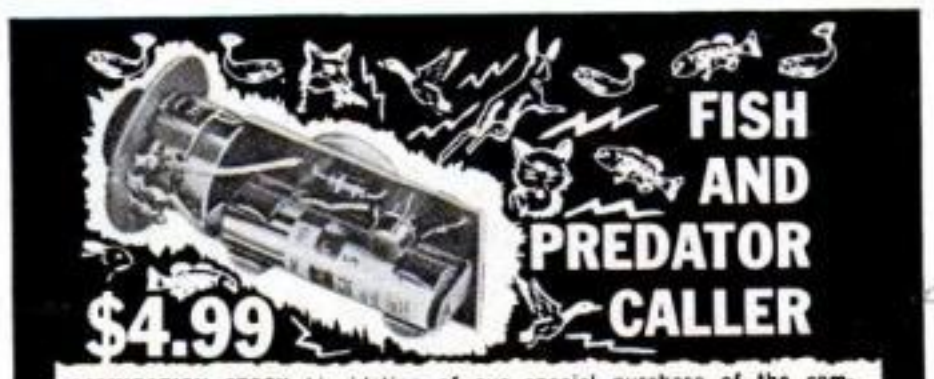

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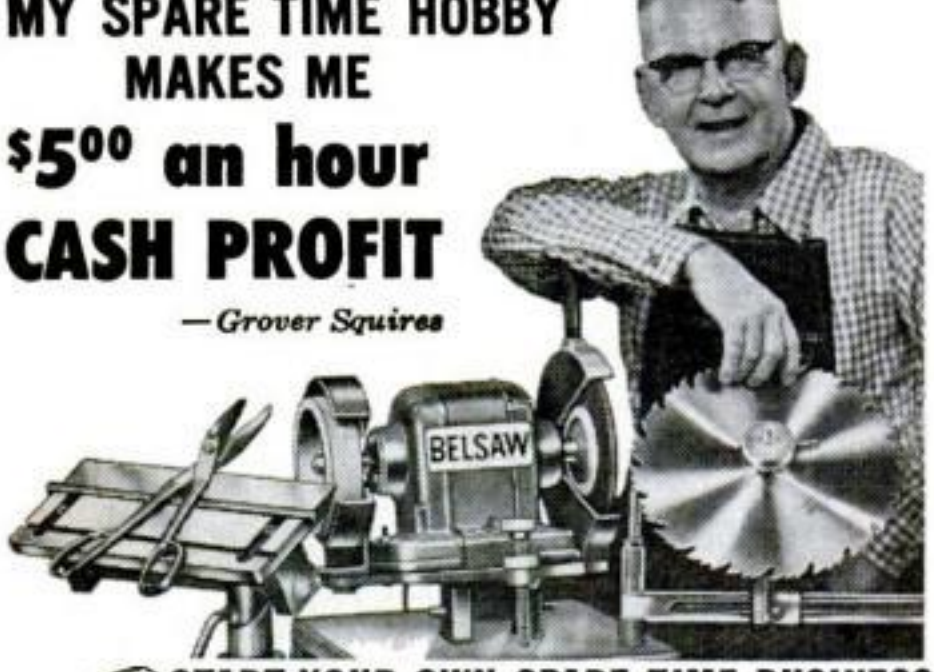

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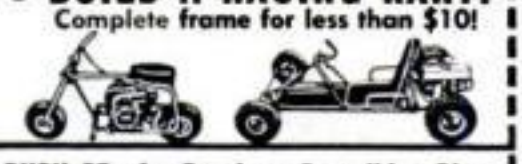

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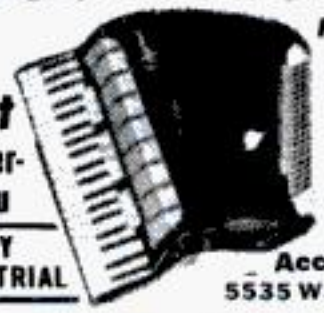

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GETTING AHEAD

A monthly column to help you prepare yourself for a better job

By Dr. Lewis R. Fibel

INTERESTED in becoming a watchmaker —a highly skilled trade? The Swiss Watchmaking Industry is offering scholarships to U.S. students for study in technical schools in Switzerland. Teachers of watchmaking, too, can apply for funds to study the latest technical advances in Switzerland. A program to contribute toward new schools of watchmaking in the U.S. is also being set up.

● Crazy about golf? There's a new school that will train you to be a golf pro. While golf is an important part of the curriculum, the Bagg Professional Golf School (P.O. Box 1908, Winston-Salem, N.C.) also gives courses in grounds maintenance (grasses, agronomy, plant foods, soils) and club management and accounting.

"I own my own plumbing business—extensive and profitable—and my son will take over some day. He wants to go to college next year. Could he also fit in some study on plumbing to save on apprenticeship later?"—H.P.J., San Francisco.

Quite a few colleges offer courses on plumbing. Among those in California: Contra Costa College (San Pablo), Long Beach City College, Oakland City College, Pasadena City College. In other states: Jackson (Mich.) Junior College, State Univ. Agr. & Tech. Institute (Delhi, N.Y.); Columbia Basin College (Pasco, Wash.).

"How do I prepare to take the tests for a real-estate salesman's license?"—H.H.L., Cheswick, Pa.

For information on licensing requirements, write the Real Estate Commission at your state capital. Many states also furnish manuals to help applicants prepare for the written examinations.

For a list of colleges near you offering suitable courses (possibly some at night), write the Natl. Assn. of Real Estate Boards, 36 S. Wabash Ave., Chicago 60603.

Correspondence courses are offered by the Weaver School of Real Estate, 3521-S. Broadway, Kansas City, Mo. 64111, and LaSalle Extension Univ., 417 S. Dearborn St., Chicago 60605.

"I would like to know of Illinois and West Coast colleges with courses on international relations and Asian affairs."—M.W.H., Fort Devens, Mass.

International Relations: Bradley U. (Peoria), U. of Chicago, Ill. State Normal U. (Normal, Ill.), U. of Ill. (Urbana), U. of Calif. (Berkeley), Los Angeles State College, Occidental College (Los Angeles), Pomona College (Claremont, Calif.), and others.

Asian studies: U. of Calif. (Berkeley), U. of Calif. (Santa Barbara), Pomona College (Claremont), U. of S. Calif. (Los Angeles), U. of Ore. (Eugene), U. of Wash. (Seattle). None in Illinois.

"I wanted to be a dentist, flunked out at college, and joined the Army, where I learned no trade. I'll be out of the Army soon; don't want to go back to college. What next?"—L.M.O., APO N.Y.

Have you thought of mechanical dentistry? The Natl. Assn. of Dental Laboratories, 201 Mills Bldg., Washington 6, D.C., can send you career information.

Some dental technicians learn on the job. Others study at junior (two-year) colleges such as the NYC Community College in Brooklyn, and Fullerton (Calif.) Junior College. Others attend private schools like the N.Y. School of Mech. Dentistry, 125 W. 31st St., NYC, and the Kerpel School of Dental Technology, 820 7th St. NW, Washington, D.C.

"Where can I get information on careers for geographers?—in work outside teaching."—D.R.H., Tenafly, N.J.

Geography is a tight little field; only about 2,500 geographers are employed in the U.S. About two-thirds of these are engaged in college or university teaching or research. Most of the rest work for government agencies doing field study, prepar-

[*Continued on page 42*]

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You won't have to look very hard, because the front of the Volkswagen Station Wagon carries the biggest chrome brand in the whole business.

But then, our box carries the heaviest load in the business: over a ton of things. (In 170 cubic feet of space.) Almost twice as much stuff as the biggest regular wagon holds.

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And if the stuff is people, the box takes 9.

What it doesn't take much of is oil. (5 pints is all.) And a box that averages better than 20 miles per gallon of regular doesn't take much gas either.

When it comes to windows, you can give 2 to each passenger (and keep 5, plus the adjustable sunroof, for yourself).

Our wagon is only 9 inches longer than our sedan, so you can park it in a space that's 4 feet too short for ordinary wagons.

But maybe you don't really want an ordinary wagon. That kind of thinking can get you into a box.

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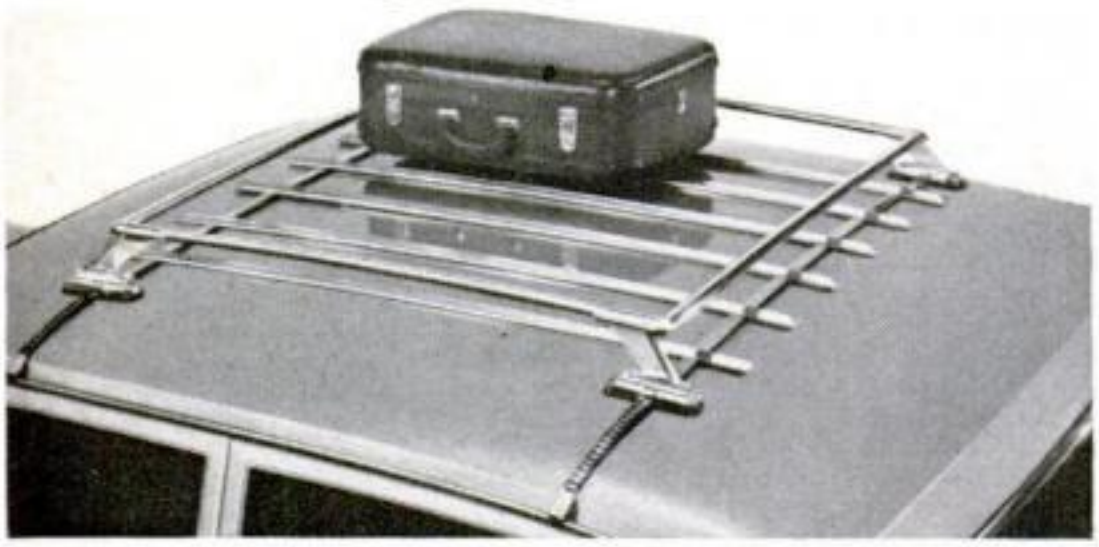

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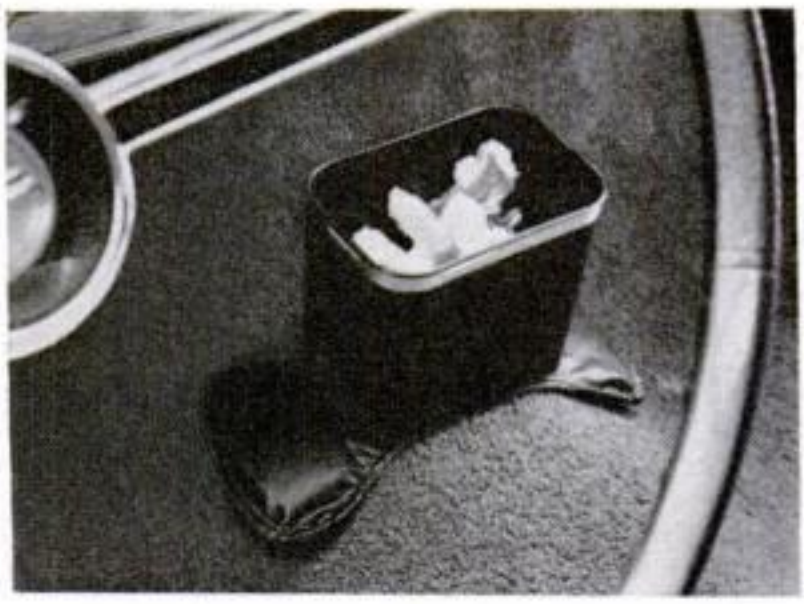

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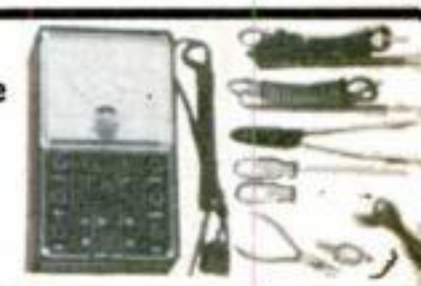

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Detroit report...

FLEXIBLE-BLADE FANS are causing a quiet revolution. Air-conditioning places an extra load on the cooling system, and the viscous fan coupling commonly used up to now is an expensive solution. Ford has scheduled a running change to new fans with flexible steel blades and rigid coupling to the fan pulley on all air-conditioned models.

Ford's "flex-fan" was developed by Ford but will be produced by Canadian Filters (a Fram subsidiary). Blade pitch is governed by centrifugal force, and power consumption at speed is less than with viscous couplings. Five blades are used, and the fan pulley turns at 1.25 times crankshaft speed in order to provide adequate cooling at idle and in heavy traffic.

The flex-fan is immune to temperature changes (while fluid viscosity is badly affected in cold weather). In brief, it is lighter, cheaper, and more reliable than the cooling fan that it replaces.

Dodge and Mercury are planning sports models for 1966½. The Mercury is known as the Cougar to the people who are responsible for its development, but its official title at the moment is Project 77. It will share many components with the Mustang, but will actually be somewhat bigger.

Dodge will call its new Sportster the Charger and it may appear before the new Mercury. It will be based on the Charger show car—a clean-looking full fastback on the 117-inch Coronet wheelbase.

Pontiac's new sporty car will probably be introduced late in 1966. Chief reason for the delay is Pontiac's production problem: The division is working its engine plant 24 hours a day, seven days a week to keep up with demand. Next November, an addition to the engine plant will be completed, raising Pontiac's production capacity from 800,000 to a million cars a year. Only when the existing models are assured of engine supply can Pontiac afford to bring out something completely new.

Sketchy reports indicate the car will be a small four-seater, lighter than the Tempest, with fresh, clean styling. It probably will have the new six-cylinder overhead-camshaft engine as the standard power package, with the 362-cubic-inch V-8 as an option.

The restyled Corvair has failed thus far to dent the Mustang's runaway sales success. Chevrolet is betting that a greater choice of options will do the trick. Watch for new bimetal lightweight wheels, radial-ply tires, and suspension and steering kits.

Big changes are coming in the 1966 Chevelle, Tempest, Olds F-85, and Buick Special groups. In addition, the Chevy II will be all new—as will the Falcon. The Falcon, in common with the Fairlane and the Comet, will look a lot like the Chevelle. The four-door Thunderbird is now slated for 1967 introduction, but the 1966 model will have significant changes. The full-size Fords had all-new bodies in 1965, and the main difference for 1966 will be a softening of the harsh lines, with some new roof and fender lines. Lincoln will introduce a two-door Continental. The classic styling theme introduced for 1961 will be broken up with more side sculpturing and creases in the hood and deck lid, but the overall dimensions will be similar.

Mercury's wrist-twist steering, which insiders say will be a regular production option within a year, is expected to cost less than $100 over the present power-steering option. Major part of the extra cost is the completely independent power system that backs up the regular power supply in case of failure. The auxiliary system is electrically driven, and works even if the engine isn't running.

Though the system's prototype has a 15:1 ratio and three turns lock-to-lock, Ford engineers say that variable steering ratios with less than two turns offer the ideal steering. The system will be gradually worked up to this setting, they say, as the public gets used to wrist-twist maneuvering.

Jan P Norbye
Automotive Editor

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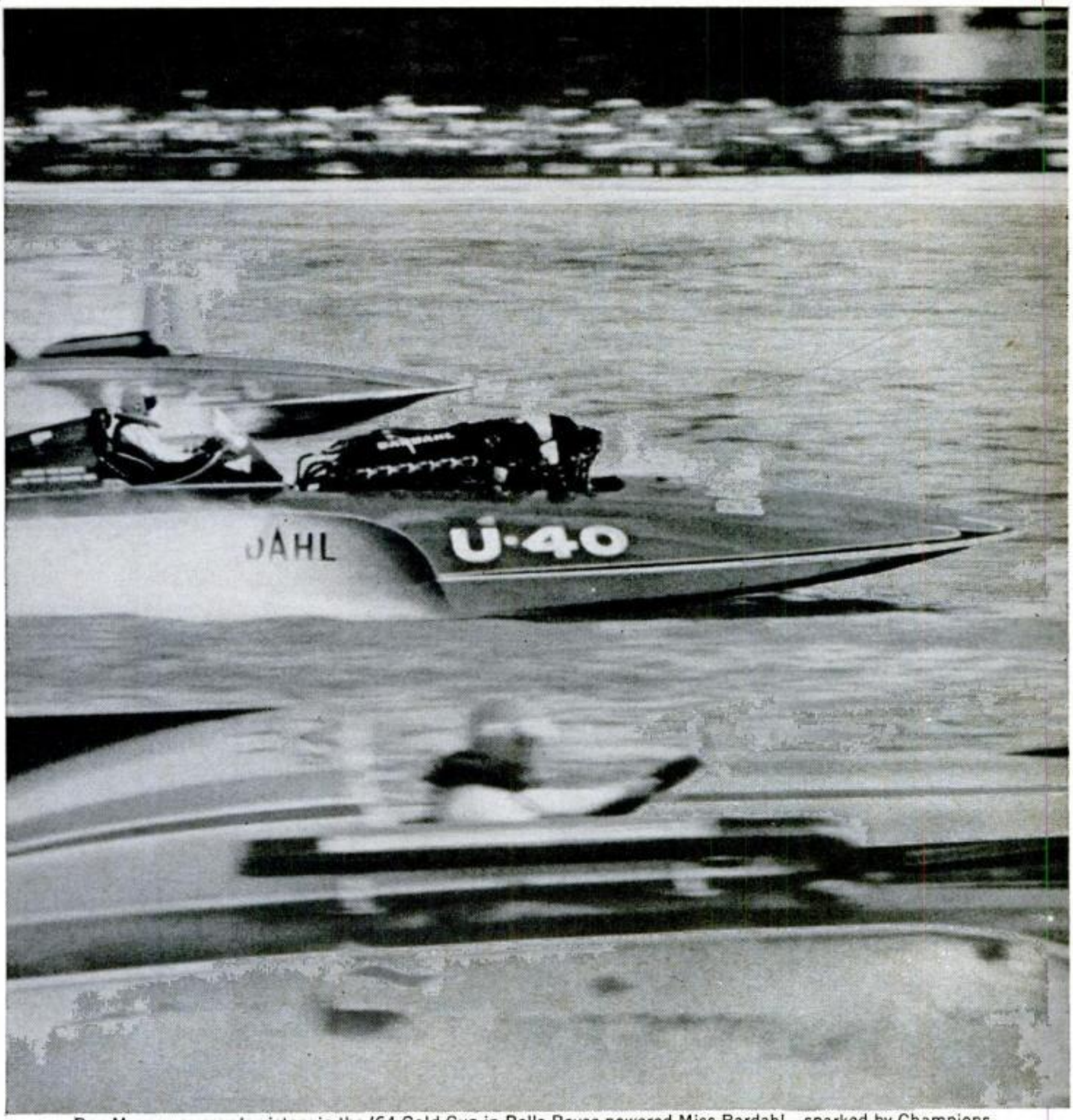

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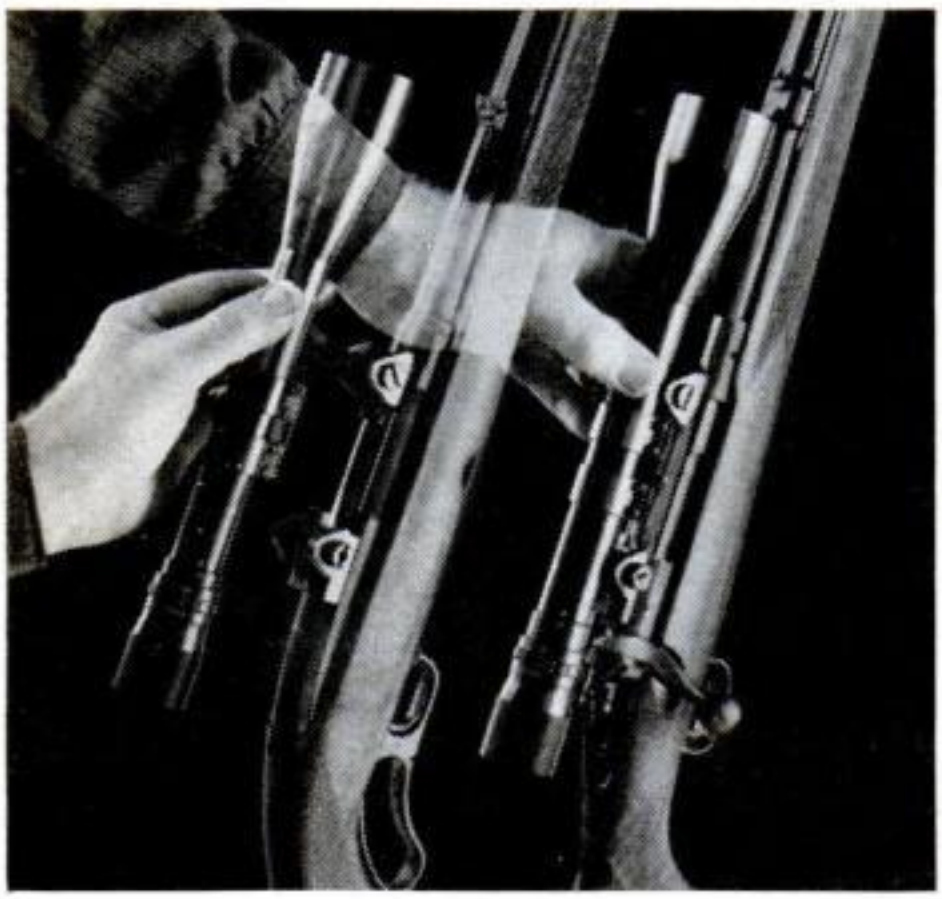

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RIFLE SCOPES

Getting Ahead

continued from p. 32

ing and interpreting statistics, maps, and diagrams. A small but growing number work for map and textbook publishers, travel agencies, and manufacturing firms.

You can get more information on your chosen career from the Assn. of Amer. Geographers, 1201 16th St. NW, Washington, D.C. 20036.

Where in my state can I learn sewing-machine repair?"—B.C., Scranton, Pa.

At the Keystone Sewing Machine Repair Inst., 807 Carpenter St., Philadelphia, and the Technical Trade School, 221 Seventh Ave., Altoona.

"Are there schools that teach tool-and-die making?"—M.T., Brooklyn, N.Y.

Tool-and-die making requires a broad knowledge of machining operation, shop practices, math, and blueprint reading. The varied training and experience needed is often gained through apprenticeship or on-the-job training, but in selecting apprentices, employers give preference to those with more education.

The Allied Institute of Technology, 1338 S. Michigan Ave., Chicago 60605, teaches tool-and-die making. You might find one nearer home under "Schools" in your classified telephone directory. The International Correspondence Schools, Box 486, Scranton, Pa. 18515, offers a correspondence course.

"I'm interested in taking up drafting. Would an employer value correspondence-course study or must one have a college degree?"—E.W., S. Charleston, W.Va.

Employers generally are more interested in competence than in the method by which it was gained. Correspondence is a proven method for learning drafting, and an acceptable means of entry into beginning drafting jobs. For advancement to detailer, estimator, technician, and junior engineer, more formal education is called for. This could well be obtained later through college attendance at night.

• • • •

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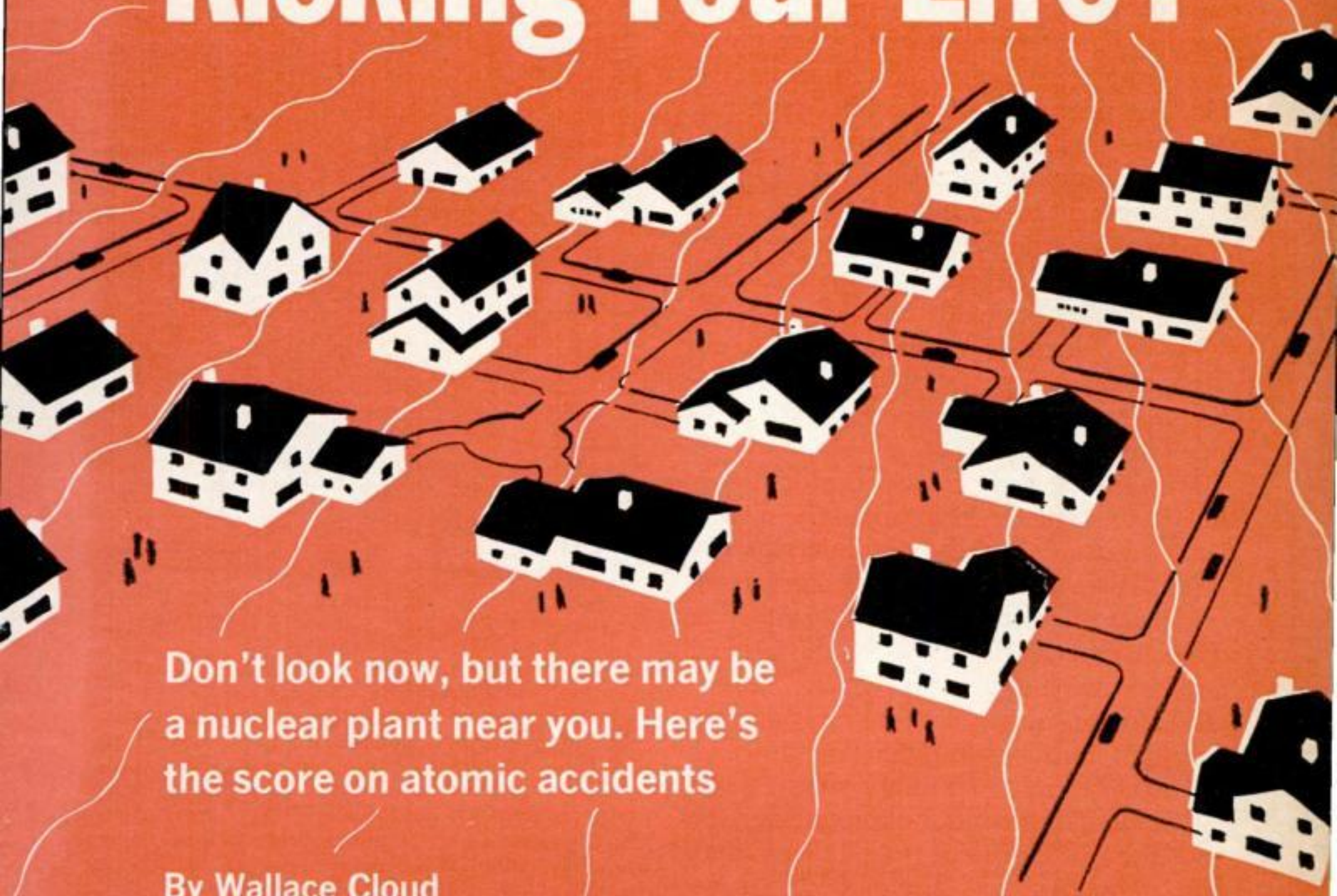
Is Atomic Industry Risking Your Life?



Don't look now, but there may be a nuclear plant near you. Here's the score on atomic accidents

By Wallace Cloud

AS RADIATION alarms wailed, Robert Peabody ran down two flights of stairs and cut through an emergency exit. Stripping off his contaminated clothes, he ran naked across an empty field to the first-aid shack near the plant.

It was last July 24, at the United Nuclear Corp. plant in Charlestown,

CONTINUED

With atomic industry spread all over the U.S., is it adequately controlled for public safety?

R.I. Peabody had been pouring a uranium-235 solution from a slender plastic bottle into a squat tank.

When he had almost emptied the three-gallon bottle, there was a blue flash, millions of neutrons raced through his body, and the solution boiled up, splashing radioactive liquid over him.

Simply because of the change in shape of its container, the U-235 solution had reached "criticality." That set off a chain reaction lasting perhaps a millionth of a second. The fission products were much more radioactive than the uranium itself, but not as deadly as the neutrons.

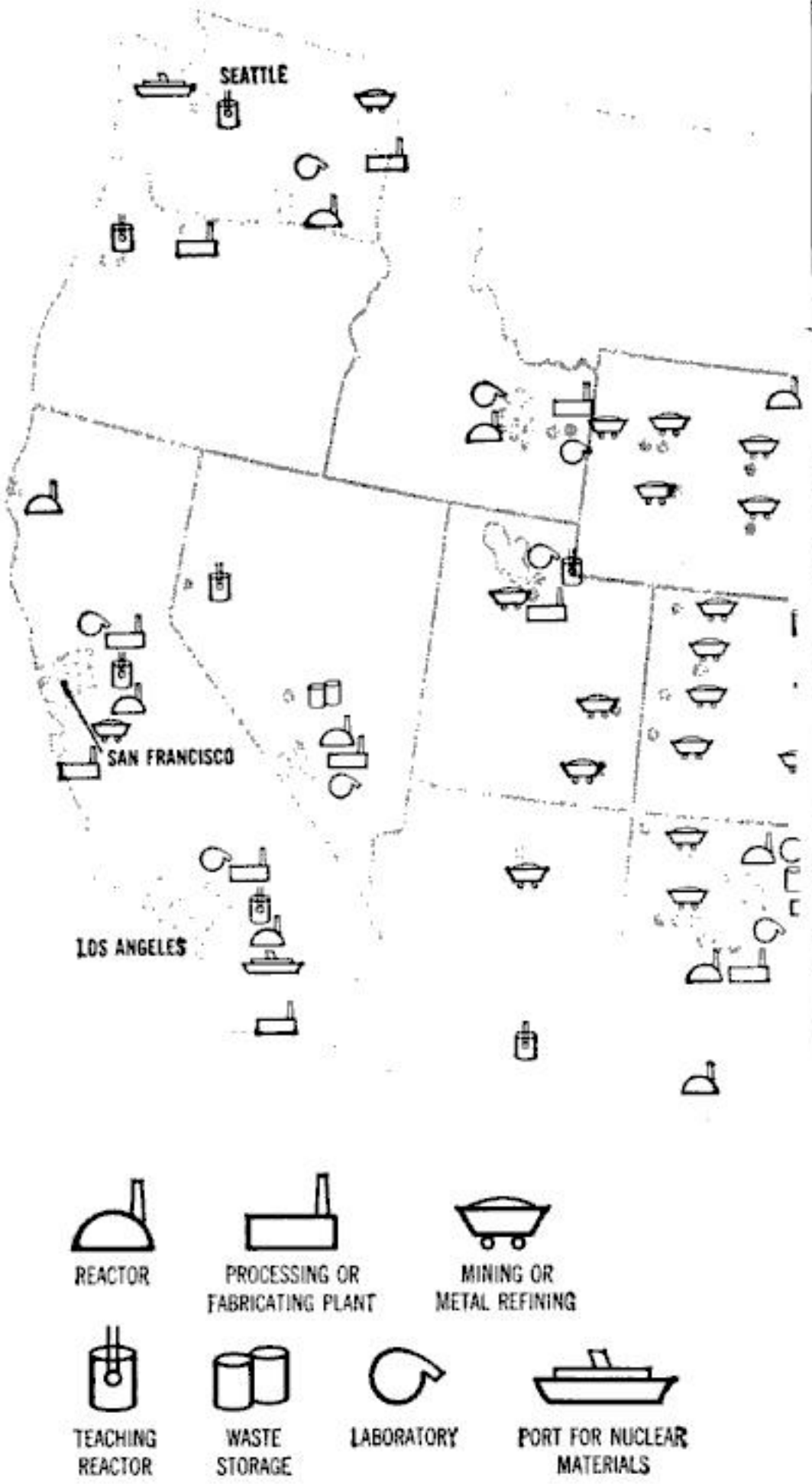
In the first-aid shack, while his coworkers wrapped him in blankets, Peabody began to vomit. He was also bleeding internally. From the neutron burst, he had received enough radiation to kill him at least 10 times over.

He was dead 49 hours later, his body radioactive enough to endanger the doctors and nurses who were helpless to save him.

A unique feature of this accident was that it took place in a privately owned plant *licensed* by the Atomic Energy Commission to recover uranium from scrap material, not in an AEC-controlled plant. Licensing is one way the atomic industry has been growing, one reason why atomic plants are no longer concentrated in a few isolated locations, as the map at right strikingly shows.

AEC and industry spokesmen say the field has an accident rate lower than most industries, and that most deaths by accident have such common causes as fires and electrocution. They claim that no injuries to the public have resulted from accidents involving radiation.

Perhaps, however, the growth of the industry is increasing the probability of atomic accidents. And it may well be that some plants are more dangerous than others. Let's look at the kinds of



Atomic industry sprawls across the U.S. in a way that taxes a map maker's ability, due to the large number of installations in some areas. This map shows locations of major facilities, and types of facilities in each area. The Atomic Energy Commission has plants and laboratories in 28 states and Puerto Rico; contractors that operate those facilities have other plants and labs, some in or near major cities. About 13,000 other users of radioactive and fission-

accidents that *have* involved nuclear materials, and at the possible hazards to the public and to those who work in atomic plants.

Criticality Accidents

The 20-odd criticality accidents that have occurred in the U.S. are probably

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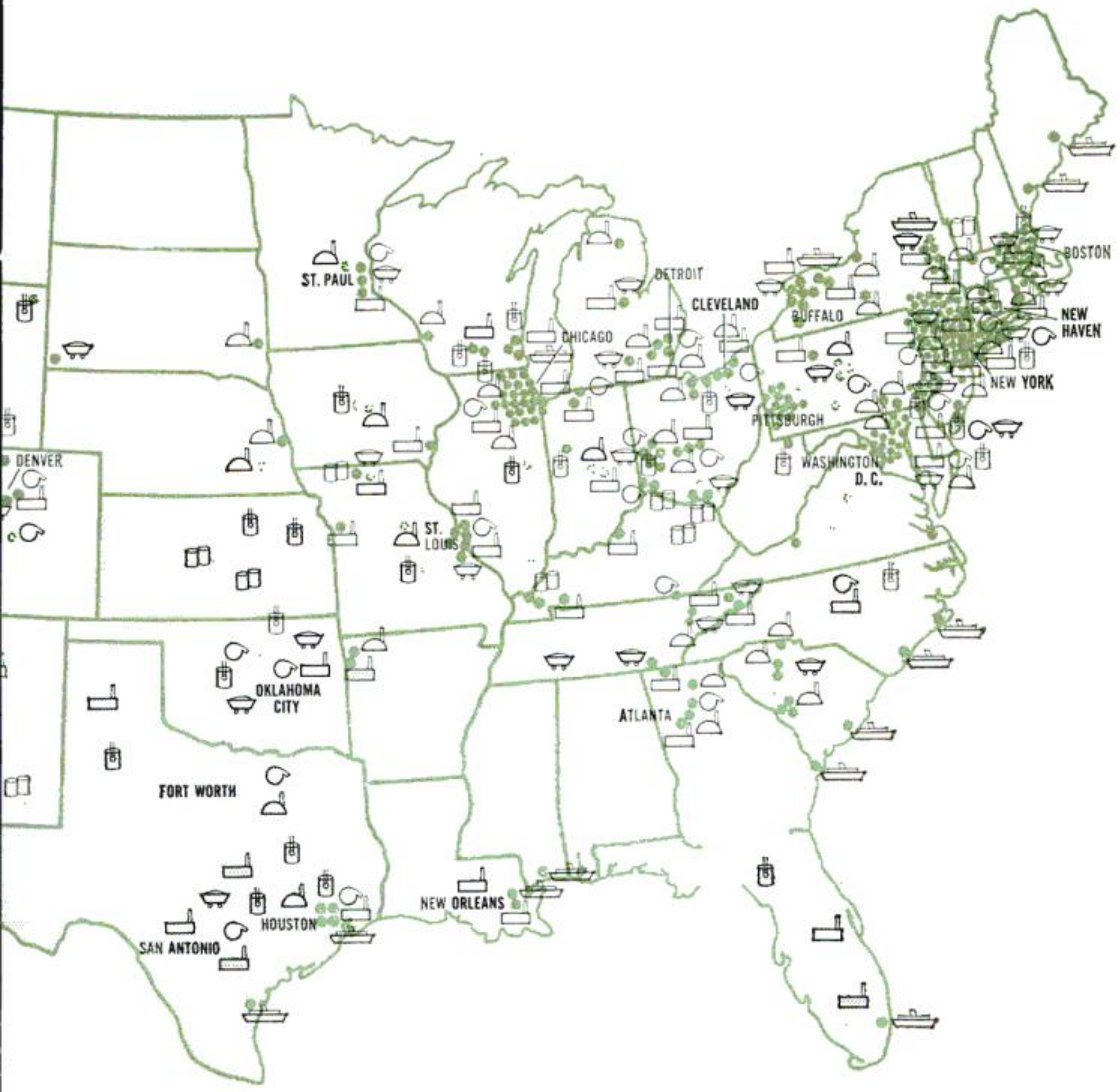

able materials are now licensed, 9,200 of them by the AEC and 3,800 by licensing agencies of nine states (shown in shaded color). Most licensees are hospitals or industries that use small amounts of radioactive chemicals, but hundreds of companies process or fabricate nuclear materials in substantial quantities. Other licensees and government agencies are operating or building some 150 nuclear reactors to generate electric power or for research. Research and teaching reactors are at about 50 colleges and universities. Other facilities are devoted to processing, storage, and disposal of radioactive wastes from reactors and nuclear plants. To and from all locations, nuclear materials are moving in increasing quantities by rail, truck, plane, and ship—at the rate of more than 250,000 shipments a year, which pass through or near communities all over the country, using the same routes as other traffic.

the most dramatic type. The chain reaction that takes place is essentially the same as that in an atomic bomb.

Criticality happens when a certain concentration of U-235 or plutonium is brought together within a compact space. There's unlikely to be a full-scale atomic explosion—the fissionable material isn't held together long enough to allow an efficient release of energy.

There have been seven deaths in criticality accidents. The first two men to die, at Los Alamos in 1945 and 1946, were scientists who were moving pieces of material together by hand to test criticality, insufficiently aware of the

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danger. A worker at Los Alamos died in 1958 when an unforeseen concentration of plutonium occurred in a processing tank.

Three more men lost their lives in 1961 in the explosion of the Army's experimental SL-1 reactor near Idaho Falls, Ida. The seventh death was that of Peabody.

In those and other criticality accidents, heavy radiation doses were received by survivors, including five men who were sterilized by near-lethal amounts of radiation at Oak Ridge in 1958 (four later recovered fertility).

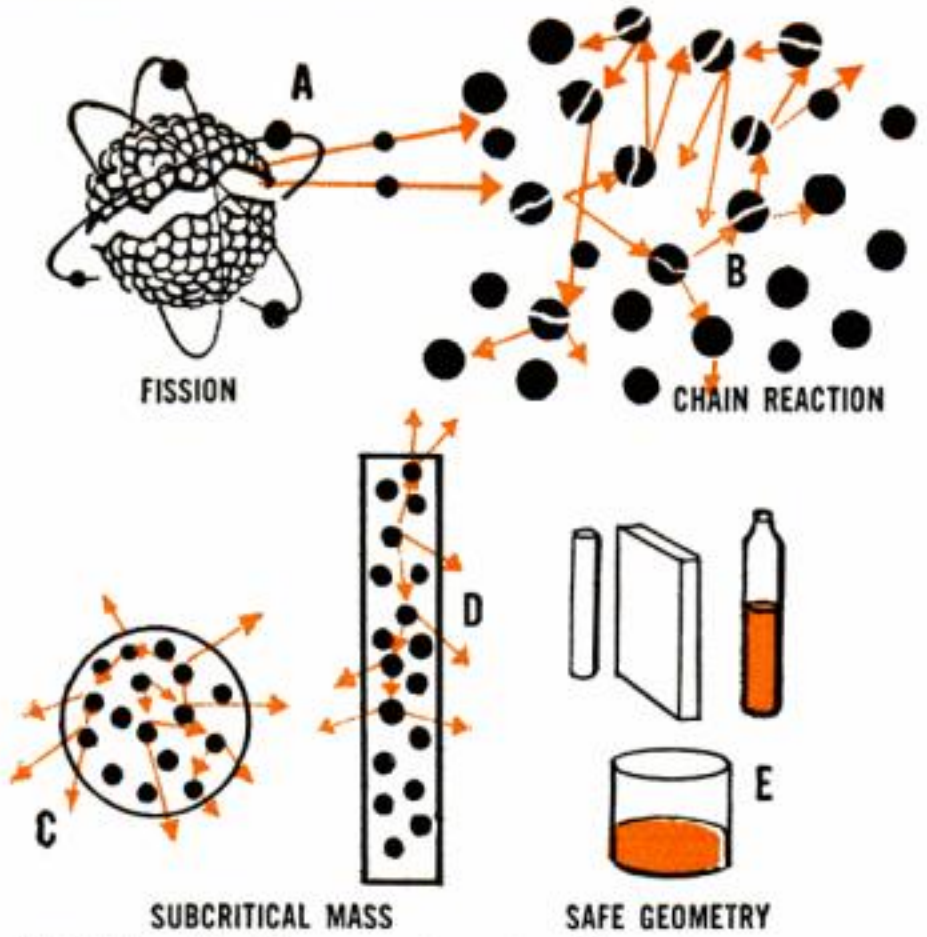
Normally, steps are taken to prevent accidental criticality. But union officials representing atomic workers say near-accidents are frequent. They charge that company training programs often fail to include sufficient emphasis on criticality.

After the Peabody accident, AEC investigators found that an unsafe short-cut method had been improvised for one step in uranium purification. Peabody was using this method, apparently unaware that he was handling an unusually concentrated solution.

Reactor Hazards

Nuclear reactors depend on criticality to produce heat, which can be used to generate electric power. Due to the trend toward locating power reactors in population centers, citizens' groups have become concerned over the possibility of a major reactor accident.

While an atomic bomb contains only a few pounds of fissionable material, a power reactor may have as much as 100 tons of uranium—a mixture of fissionable U-235 and nonfissionable U-238—in the bundle of fuel rods that form its core. A chain reaction in the U-235 bombards the U-238 with neutrons, converting it to fissionable uranium and plutonium, which continue the reaction. Radioactive fission products accumulate in the core. Heat produced by fission is carried away by water circulating through the core. Control rods of a neutron-absorbing material, such as cadmium, are pushed in between the fuel rods to slow down or stop the chain reaction under way.



"Criticality"—an atomic threat

Atoms of uranium-235 and plutonium spontaneously break up, releasing neutrons (A), which can split other fissionable atoms, releasing more neutrons. The chain reaction (B) builds up to an atomic explosion if there's a compact "critical mass." In a subcritical mass, a large number of neutrons escape (C), and

A reactor can "run away" if control rods jam or if the cooling water is lost, resulting in overheating and possible melting of the fuel. This may cause an explosion severe enough to destroy the core and spread radioactive material over the landscape.

Perhaps the most famous reactor accident occurred in 1957 at Windscale, in western England. An air-cooled plutonium-producing reactor overheated, and the uranium fuel and surrounding graphite caught fire and burned for four days. Vaporized fission products, mostly radioactive iodine-131, were distributed as far away as Denmark. In a 200-square-mile area, 250,000 gallons of milk were dumped due to contamination with iodine-131. The reactor was ultimately sealed up with concrete.

The 1961 explosion of the reactor in Idaho occurred while the reactor was shut down for overhaul. The reactor exploded when its central control rod was pulled too far out, no one knows why. Radioactive dust was scattered over a three-acre area, and iodine-131 was

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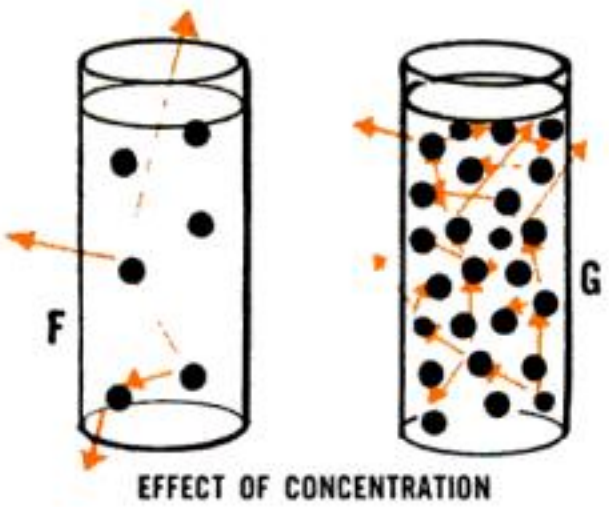
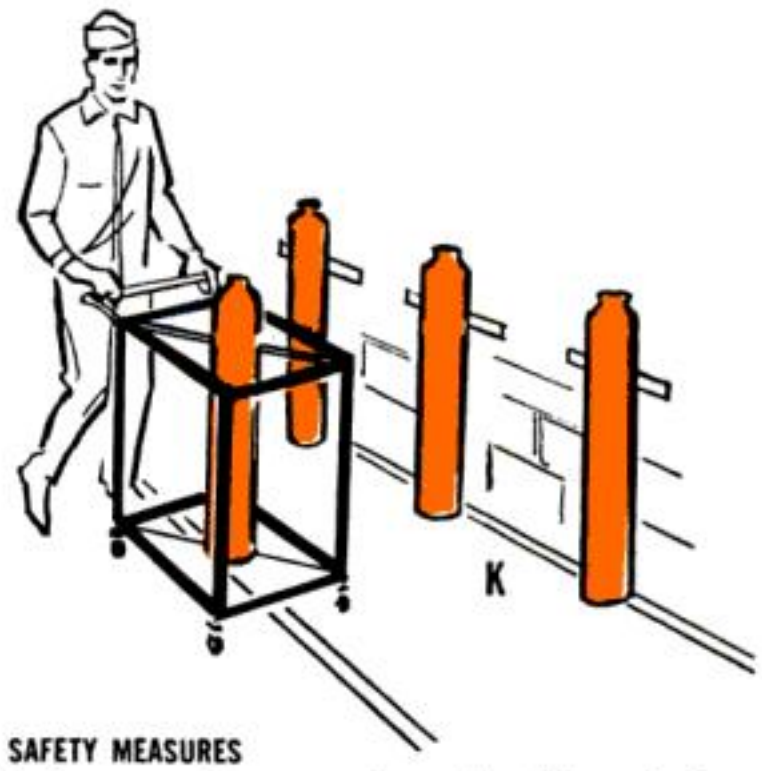




the reaction dies out. A shape with much surface allows neutrons to escape even if there's more than a critical amount (D). Thus, fissionable materials are handled in shapes and containers of "safe geometry" (E). In a solution of a uranium or plutonium compound, a low concentration allows neutrons to escape (F); but if the concentration is increased, a chain reaction can proceed (G). Similarly, if subcritical amounts are close together, interaction of neutrons between the masses can sustain a chain reaction (H). If a subcritical mass is placed in water, hydrogen atoms in water reflect neutrons back into the material (I); criticality can occur due to neutron reflection by water in a person's body (J). To prevent criticality, fissionable materials are handled in safe containers, kept safely separated (K).

found as far away as Burley, 90 miles to the southwest.

There have been other accidents involving research reactors, and technicians have been exposed to varying amounts of radiation, but there has not yet been a major accident with a power reactor. A 1957 AEC study estimated that the worst possible accident with a 500,000-kilowatt reactor located 30 miles from a city could kill 3,400 people and injure 43,000. Such an accident was called "incredible," but the study said it just possibly could happen.

Power reactors are still largely experimental, and have been plagued with minor operating problems. There is still no standardized, completely reliable design. When a reactor is opened up to be refueled, it is common to find that many fuel rods and mechanical parts have corroded or broken or jammed, making refueling a difficult operation in which workers are often exposed to unexpected amounts of radiation.

Nevertheless, electric companies keep trying to locate power reactors in cities. They say automatic safeguards will shut down a runaway reactor, and that in case of a "maximum credible accident," the containment shell around the reactor will prevent radioactive fallout from being dispersed.

When a power company asked the AEC in 1963 for a license to build a million-kilowatt reactor in the heart of New York City—in the borough of Queens—David E. Lilienthal, who had been the first chairman of the AEC, said he "would not dream of living in Queens" if the plant were built. The company later withdrew the application, after public opposition.

Radioactive Contamination

Fuel rods removed from reactors in refueling are a major source of highly radioactive wastes that must be transported, processed, and stored, with the risk that radioactive substances will be dispersed and create a health hazard. Obviously, the same risk accompanies the handling of other radioactive material throughout the industry.

Control of such substances is usually good. But in 1951 and 1952, a radioactive form of thorium from an AEC plant

[*Continued on page 176*]

It's here: The new Super 8 system

Kodak's

They've brought the Instamatic principle to 8mm movies, along with a bigger, better picture

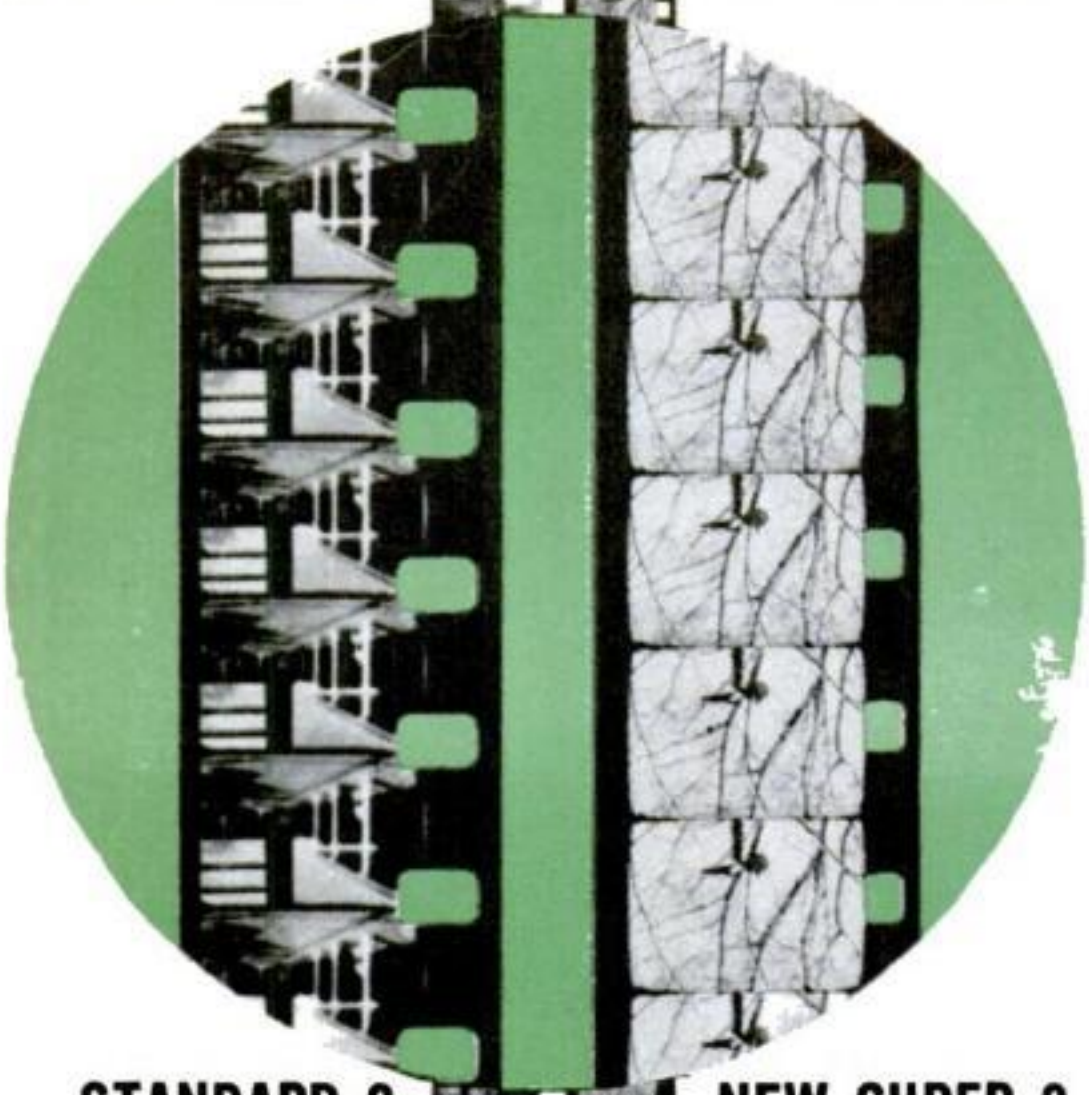
By Everett H. Ortner

THERE'S a revolution in the making in amateur movies. That shot you heard May 1 was Eastman Kodak announcing their new Super 8 movie system. The shock waves will be coming to you in the form of:

- A new 8mm movie film with a picture 50 percent larger than the old 8mm picture. That means increased screen brightness, less grain, finer resolution in your home movies.
- A new cartridge with notches in its casing that will automatically set your camera for film speed and type—a movie version of the Instamatic cartridge for still cameras.

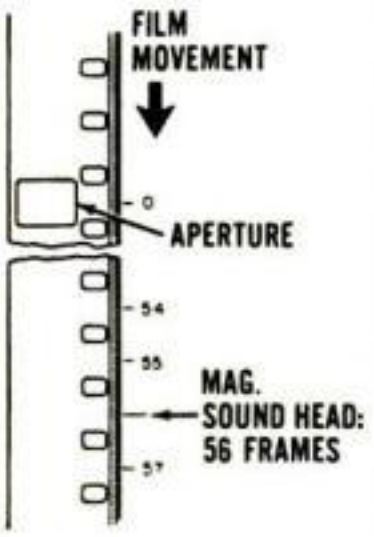
The new film has perforations on only one side. It is an actual eight millimeters wide, unlike standard 8mm film which comes in 16mm width and must be slit down the middle and joined at the ends. With Super 8 film, you won't have to take the cartridge out of your camera until you've finished shooting it.

How did Kodak accomplish this? First, they increased the area of film available for the picture by decreasing the size of the perforations. Then they



STANDARD 8

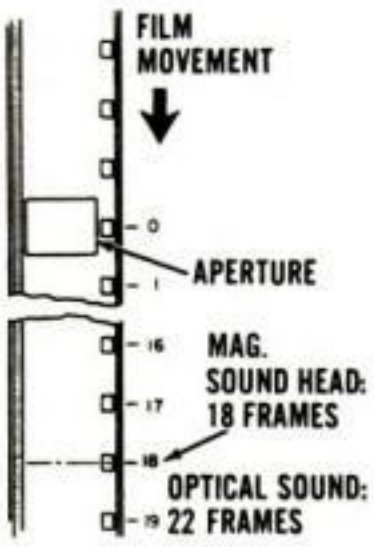
Present 8mm movie film uses a minute fraction over half the width of the film for projected image (the part of the film image that is projected; about 10 percent of the film image is not). Projected image is .172 in. wide—against film width of .314 in.—and .129 in. high. Total square inches of old image: .0222.



Present system makes problems for sound buffs. Magnetic stripe, between perforations and edge, is hard to mount. With 56 frames between tape head and film gate, splicing is a problem. No optical sound—proximity of perforations mars quality.

NEW SUPER 8

New system uses two-thirds of film width for projected image. It is .211 in. wide, .158 in. high. Total square inches: .0333—50 percent bigger than standard 8mm image. Perforations are narrowed in Super 8 film to reduce by half area they take up. Note new position of perforations, too: centered on image.



Magnetic stripe, on side opposite perforations, is easier to mount. Eighteen-frame lead between sound head and film gate eases splicing. With stripe away from perforations, optical sound—the system used in movie theaters—becomes possible.

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Revolution in Home Movies

moved those smaller perforations closer to the edge of the film. That made room for a larger picture. It also left a little room on the edge opposite the perforations. That's where the sound stripe will go, if you want sound on your film.

The first film in this new size will be an improved Kodachrome II, issued in 50-foot lengths. More films will undoubtedly follow—both by Kodak and by other film manufacturers riding on the Super 8 bandwagon.

You'll feel other shock waves in your pocketbook. The new film won't go in your present 8mm camera. The cartridge won't fit, the perforations are too small, and the optics of your camera are unsuitable for the larger image. Ditto for your projector. Ditto again for your film editor and splicer. None of them will work with Super 8.

And the larger picture means fewer pictures on a given length of film. Result: 11 percent shorter

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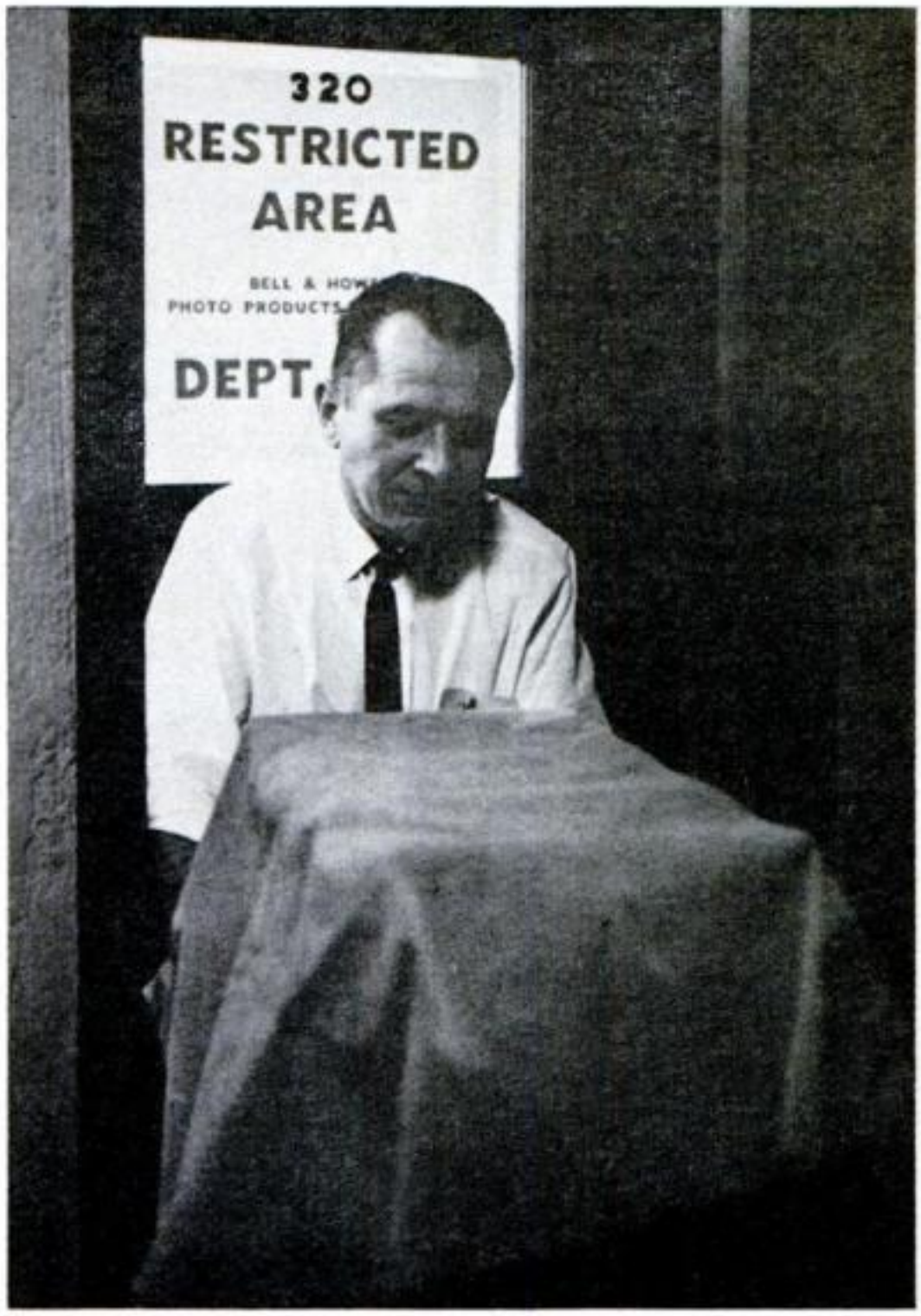
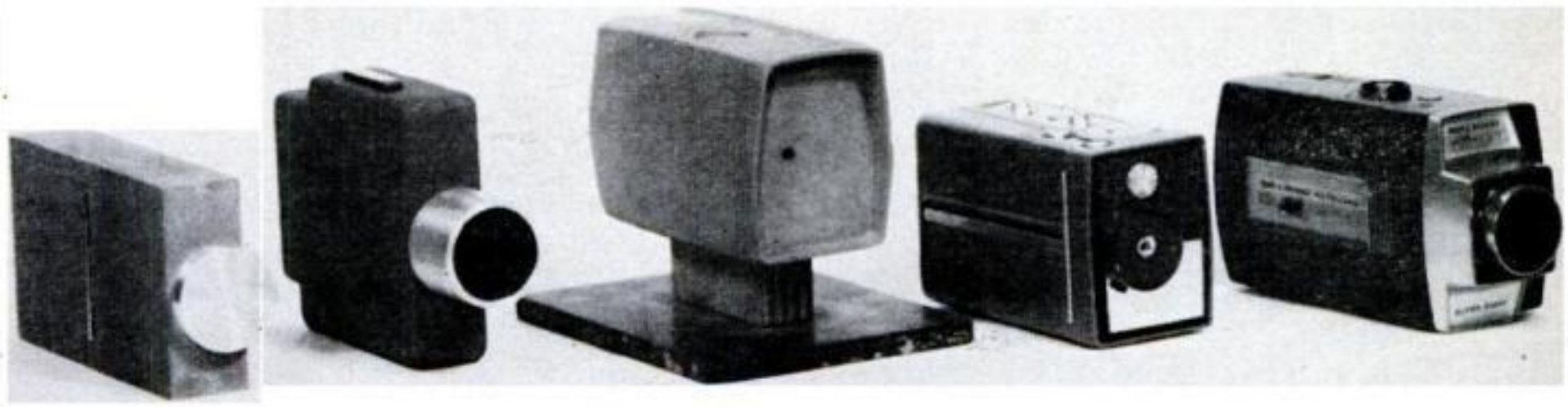


Before D day: George Krtous, Bell & Howell designer, wheels shrouded Super 8 projector from engineering lab.



Evolution of a Super 8 camera: Bell & Howell stylists began with wooden block, progressed through fancier wood model, oversized clay job, epoxy version, to final camera at right.

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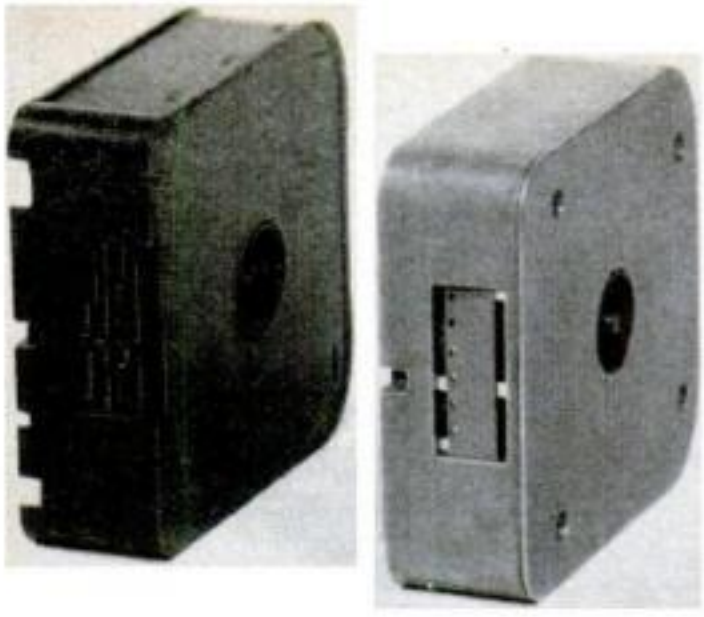
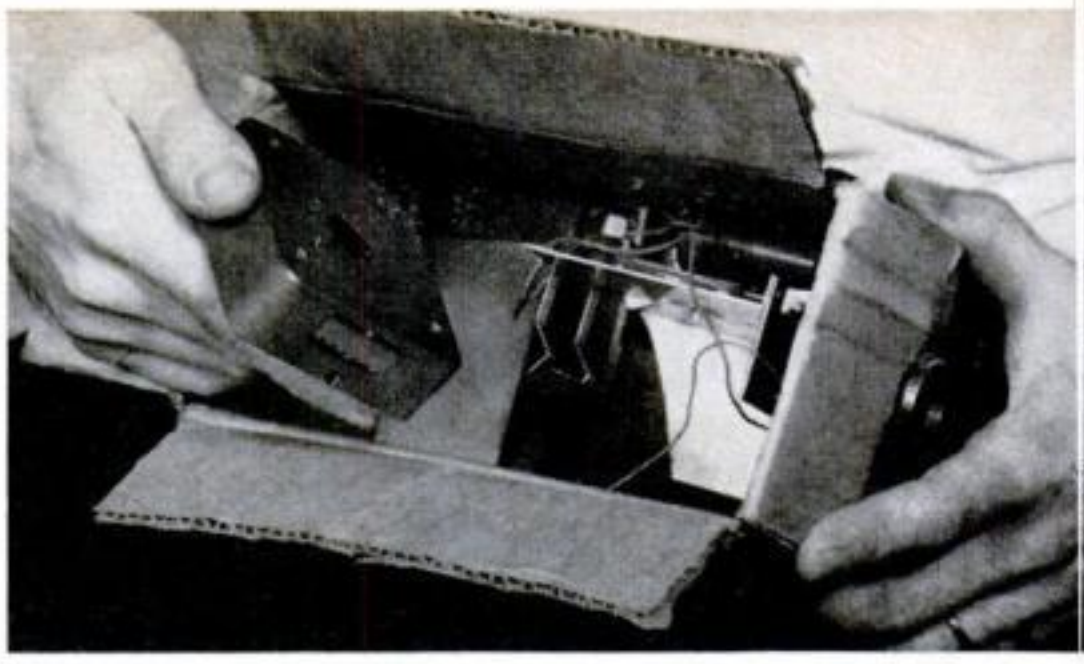


Super 8 cartridge is shown above at left. Brass version at right was made by Bell & Howell from Kodak size estimates to test cartridge, and for use as a dummy in first camera mock-ups.



Inside "Bluejay": Mechanism for first Bell & Howell camera was built into cardboard box. To test mechanism, they cut and perforated their own Super 8 film from 16mm movie film.

Bell & Howell 430 has power zoom, ASA 8-400 automatic exposure setting. T-bar grip is for shooting or carrying.

Keystone K-625 has battery drive, power zoom, through - lens viewing, CdS electric eye. It will sell for about $200.

running time. Besides that, a 50-foot cartridge of Super 8 film will cost more than the same length of old 8mm film. The only thing that won't go up in price is processing.

Is it worth it? At the design-engineering laboratories of Bell & Howell in Chicago, I watched while an engineer projected the two films—Super 8 and standard 8mm—side by side on a screen. Both films had been shot at the same time, using the same subjects. The difference was impressive. Grain, clearly perceptible in the standard 8mm, was reduced almost to the vanishing point in Super 8. Picture detail that was a fuzz in the standard 8mm screen image popped out clearly in Super 8. And the color of that new Kodachrome II, if one can judge from one showing, seemed more natural—the reds had less of that ripe-tomato hue.

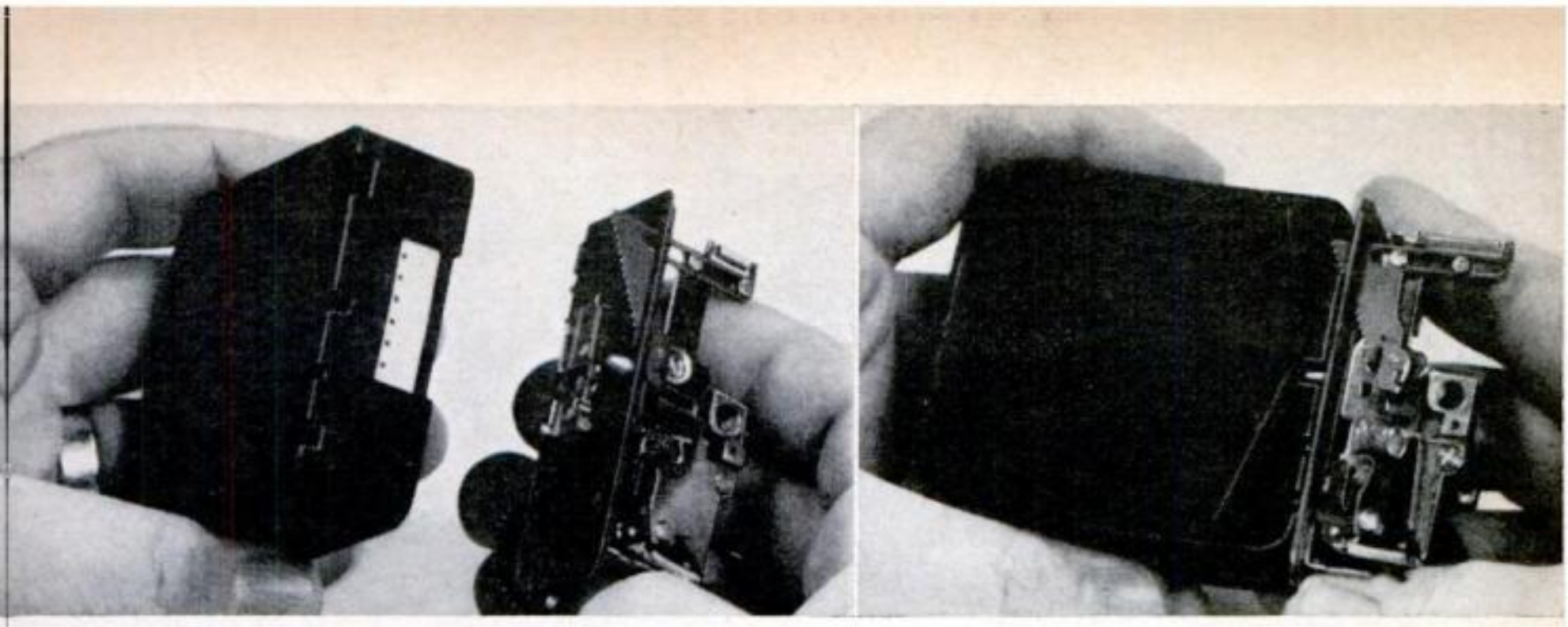
If you have a big investment in 8mm movie equipment, don't get alarmed. For the foreseeable future, you'll be able to buy all the standard 8mm film and equipment you want. Standard and Super 8—and 16mm, too, for that matter—will be produced and sold side by side.

If you're a 16mm movie buff with an 8mm pocketbook, you may want to consider switching. Super 8, in quality, begins to nip at the heels of 16mm. The Kodak people think it will compete—eventually—with 16mm for educational films; schools that have limited their classroom use of movies because of the high cost of 16mm may be happy to include Super 8 in their budgets.

Mum's the word! Kodak began its revolution in an atmosphere suggestive of that in which Eisenhower might have given the date for D day to one of his generals. Secrecy was the keynote. Outside of Kodak's inner offices in Rochester, N.Y., no one knew of Super 8 until just over two years ago. Then, to manufacturers of movie equipment, Kodak whispered its plans. After all, what good is a new film if there aren't enough cameras and projectors to use it?

So began a design challenge—and a race among movie-equipment makers to meet that challenge.

Urheberrechtlich geschütztes Material



Upper notch on side of Super 8 cartridge sets film ASA on camera; lower notch controls position of built-in Type A filter. Center notch is locator, to help you insert cartridge. ASA notch of cartridge moves against mating notched plate of camera, which sets position of ASA filter disk, a circlet of film with wedges of varying density through which light passes to meter.

I went to Chicago to get the story of how one of those manufacturers, Bell & Howell, the world's largest maker of movie cameras and projectors, met the challenge.

Bell & Howell got the word on April 11, 1963. Up to Rochester went a small team of management men and designers. There was no Super 8 film for them to examine, no cartridges. Jack Lang, vice-president in charge of engineering, listened, made a rough sketch of what he thought the cartridge might look like. He noted down the dimensions of the film.

The Kodak people warned that nothing was fixed. Designs and dimensions would change as Kodak went along. (They did, even as recently as February of this year.)

Back in Chicago, Lang dropped his sketches before his engineers. "Here it is," he told them. "Now let's make a camera and projector to fit it."

They had two years. Kodak had given them a target date for introduction of the new system: spring, 1965.

The secrecy was maintained at Bell & Howell. A code name, Earlybird, was given the Super 8 project. Camera models were designated Bluejay I and II. Projectors were code-named Pointer.

Starting from scratch. The cartridge, film, and picture size were so different that almost nothing from Bell & Howell's existing cameras appeared usable for the new ones. In fact, only one part from the old 8mm line is retained on the Super 8 cameras: the ASA filter disk, a circle of film with wedges of varying density that modify the light hitting the meter.

They had to meet an endless number of design complications. For example: The new cartridge is right-hand loading. In the past, movie cameras have loaded from the left. That was a small problem. Bigger ones loomed.

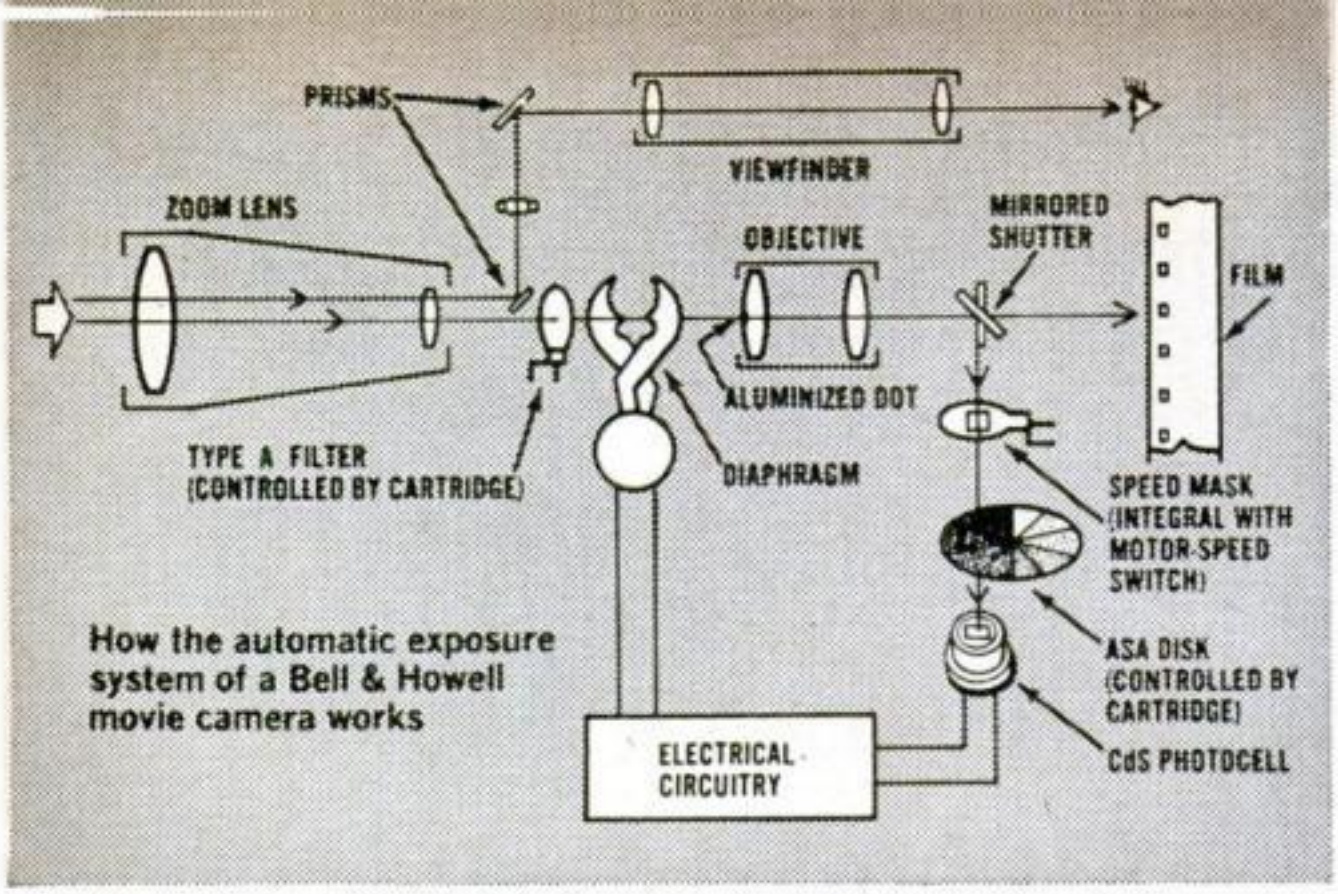
One problem: They didn't *really* know the exact size the cartridge would be. From Lang's sketches, they made a dummy, of brass, so they would have something with

CONTINUED

Bauer C-1 has through-lens viewing, automatic exposure, film speeds of 13, 18, 24 f.p.s. Electric motor drives it.

Argus 820 is all-automatic: power zoom, electric drive, electric eye. Grip folds under camera. Zoom is from 8.5mm to 35mm. Argus offers a one-year guarantee—even against accidental damage.

Urheberrechtlich geschütztes Material



How the automatic exposure system of a Bell & Howell movie camera works

Viewfinder image, right-angled twice through prisms, is same as that going to film. Position of filter—in or out—is set by cartridge. Cartridge also sets position of ASA disk—densest wedge in light path for slowest film. Light through objective exposes film; frame is then blanked out by descending shutter to let film move. Shutter mirror, now in light path, bounces light through disk to CdS cell, which governs diaphragm.

which to check on that Super 8 concept.

Another problem: The new cartridge has notches along one side that automatically set the camera for the speed of the film—just like the notches on the Instamatic cartridge. Bell & Howell had to work that into their design. They did it with that ASA disk. Slide a fast film into the camera and the disk circles around to its clearer wedge, letting more light into the meter. Slide a slow film in, and a denser wedge of the disk blocks some of the light and tells the meter to open the diaphragm. The camera has provision for nine film speeds, from ASA 10 to 400.

The built-in filter. On the same side of the cartridge is a notch that tells the camera whether the film is indoor or daylight type, and moves a type A filter in or out of place behind the lens. If you use indoor film outdoors, the filter automatically corrects for it.

What if you shoot indoor film indoors, where you don't want the filter? A pin, inset in the top of the camera, takes care of that. When you fasten a specially designed movie light to the camera, it automatically depresses the pin, moving the filter out of the way. If you use a movie light without that pin-depressing feature, you stick a little plug in against the pin. Away moves the filter.

What happens when you reach the end of your 50 feet of film? Two things. First, toward the end of the film, instead of perforations, there's a long slit. The takeup claw can't get a grip, and the film stops moving. (To make sure that you don't try to shoot that film again, the word "Exposed" appears on the strip of film in the cartridge opening.)

Bell & Howell got into the act with a little red flag. When the film counter reaches the 50-foot mark, the flag pops up in a window in the side of the camera.

There are some cute ideas that have nothing, directly, to do with the Super 8 system. Example: a tiny aluminized dot set in the center of an objective lens behind the zoom lens. It takes care of those exceptionally bright days—at the beach, for example—when the diaphragm can't close down enough to keep your film from being overexposed. As the blades close, sharpening the light to a pinpoint, that dot, acting as a neutral-density filter, blocks out an increasingly larger portion of the light. The effect at $f/22$ is equivalent to $f/64$.

A mirror that bobs. Another piece of ingenuity is a modification of the shutter. Bell & Howell engineers added a mirror to it. As the shutter moves down to blank out the film between frames, the mirror moves into the light path and bounces a stream of light down toward the meter. Thus there is an intermittent, through-the-lens light reading, with the light flicking back and forth from film to meter with every frame.

Designing a line of projectors posed more headaches. Sprockets had to be

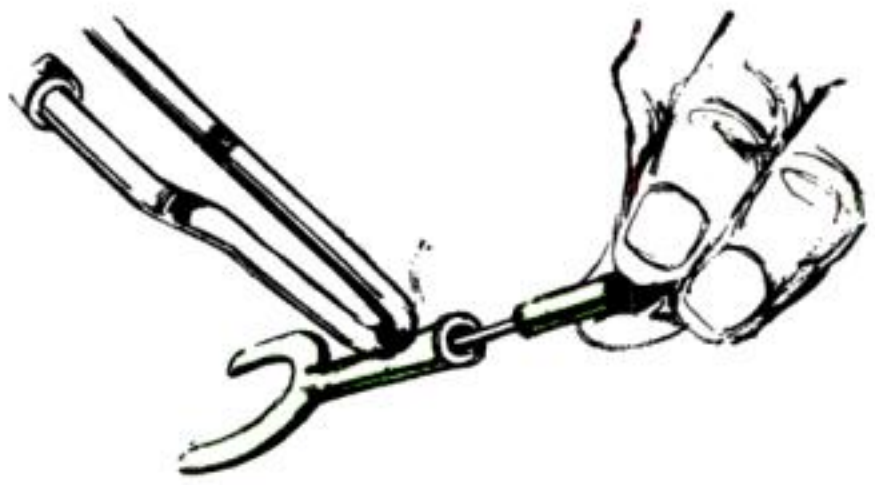
[*Continued on page 206*]

Urheberrechtlich geschütztes Material

"I'd like to see them make..."

A heat-driven spit for outdoor barbecues. The heat of the fire on a thermocouple could produce enough power to run an electric motor of low horsepower. — *Warren Hirsch, Brooklyn, N.Y.*

Removable inside grilles for station wagons so baggage could be locked in when you park at a garage or lot where the doors must be left unlocked.—*B. Netburn, Stamford, Conn.*



Solder lugs with solder already inside. Just heat with the gun and slip in the wire. This would eliminate that third-hand job of holding the wire.—*Drew Ritter, Wheaton, Ill.*

An irrigating hoe with a tubular handle. Hook up a hose with a trigger valve and you could release water as needed for masonry work or gardening.—*John Kuc, Indian Orchard, Mass.*

Dual-action brushes and combs for dogs. Why not have tiny openings to release a powder or liquid to kill off ticks or fleas as you groomed your dog?—*D. R. Burke, Sarasota, Fla.*

Everyone has his own pet idea of a gadget that he would like to see in general use. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Send to II.TS Editor, Popular Science, 355 Lexington Ave., NYC 10017. Write your name and address clearly. Contributions cannot be acknowledged or returned.

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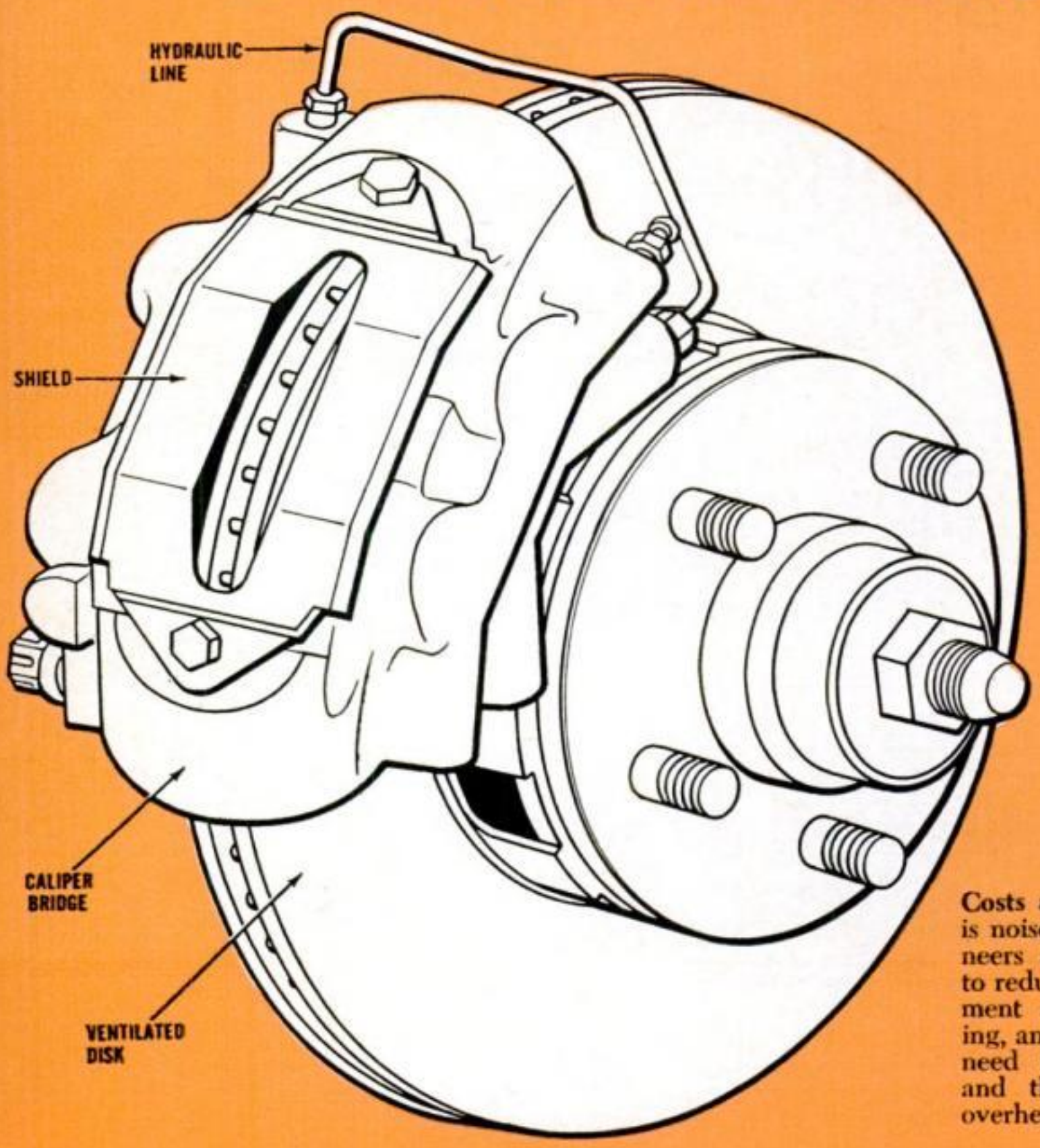
Disk brakes promise quicker and straighter stops,



DISK

Costs are a problem, as is noise (squeal). Engineers are also working to reduce fluid displacement and caliper flexing, and to eliminate the need for power assist and the risk of fluid overheating.

How Brakes Will Be

By Jan P. Norbye

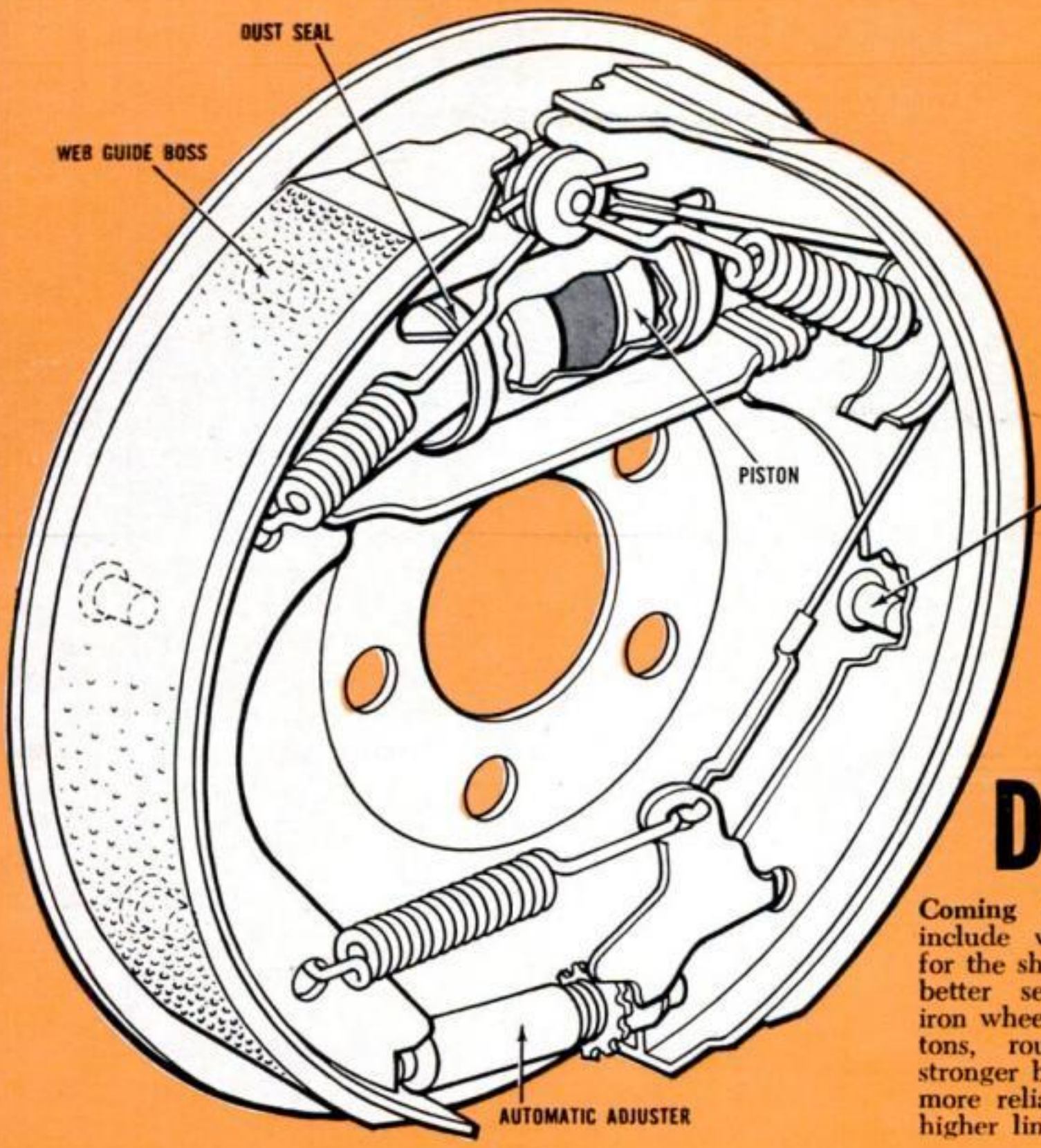
THE superiority of disk brakes is taken for granted among car buffs, but in some respects the drum brake is preferable. With drum brakes, you have low pressure on a large friction area; with disk brakes you have high pressure on a small area. Most disk brakes, therefore, need power assist.

Now the industry is experimenting with a new brake system that uses the energy stored in the moving car as a power assist. It's a low-cost system called Instantor, and tests have shown up to 33-percent improvement in stopping power over standard systems (disks front, drums rear). I think the Instantor may become tomorrow's standard brake system, but it's only one of many revolutionary inventions in auto brakes:

- I have driven an experimental Lincoln with a no-travel brake pedal.
- I learned details of Bendix and

Urheberrechtlich geschütztes Material

but drum brakes are improving in small and subtle ways



DRUM

Coming improvements include web guidance for the shoes, more and better seals, sintered-iron wheel-cylinder pistons, rounder drums, stronger backing plates, more reliable adjusters, higher lining quality.

Better Than Ever in '66

Budd load-sensing devices to govern brake-force distribution.

• I was told of a Wagner-Electric disk brake running in oil.

• I heard rumors of front disk brakes being designed for Ford's light trucks.

Brake engineers are learning more and more about the brakes we have and how to improve them in detail. Some results will be seen in the 1966 cars.

Drum brakes will be standard on all cars except the Corvette, Thunderbird, and Lincoln. According to Joe Ihnacik of Ford, "the potential exists in drum brakes to handle the braking problems." And Tom Ankeny of Pontiac says: "We have developed drum brakes that will outperform many disk-brake systems in both retardation and fade."

On the other hand, disk brakes will be available on all Ford and Chrysler models, and Rambler will continue to offer optional disks on their Classic and Ambassador models.

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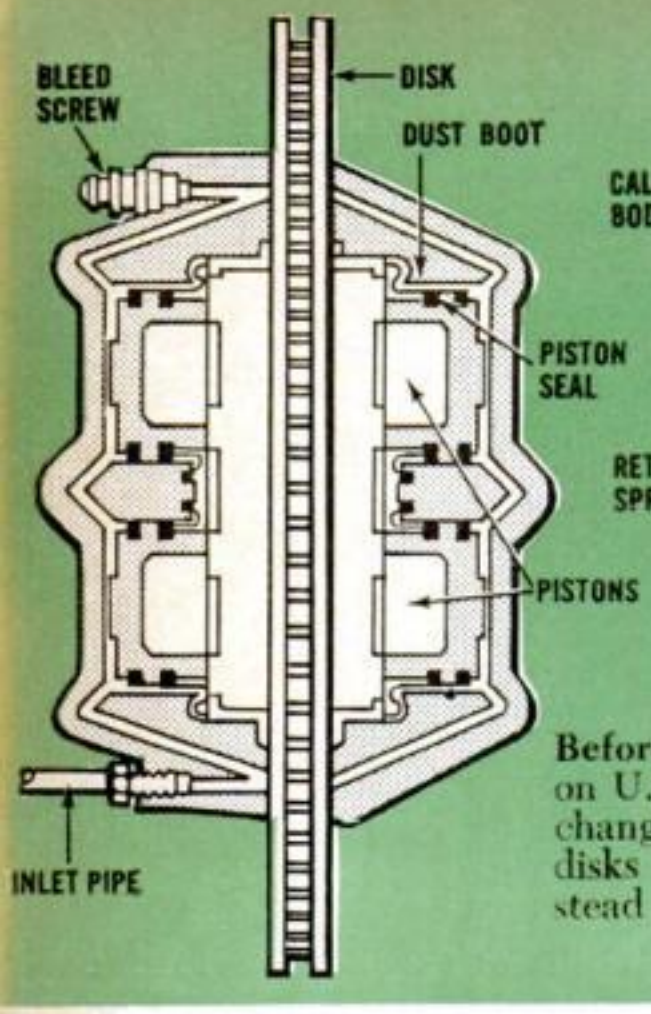
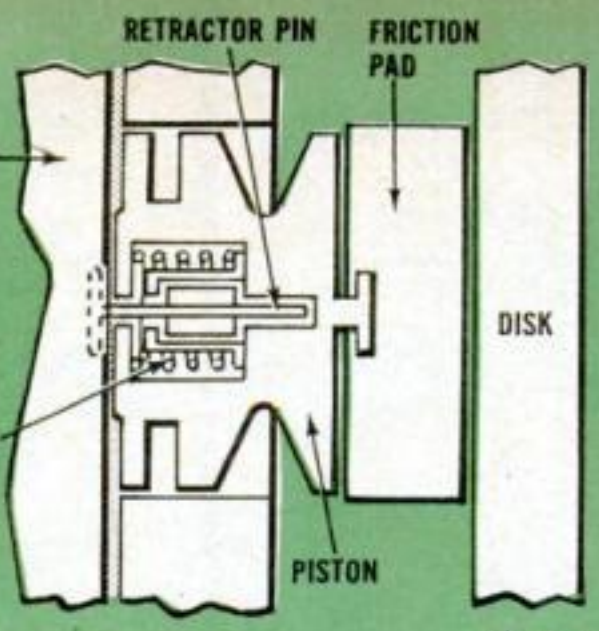
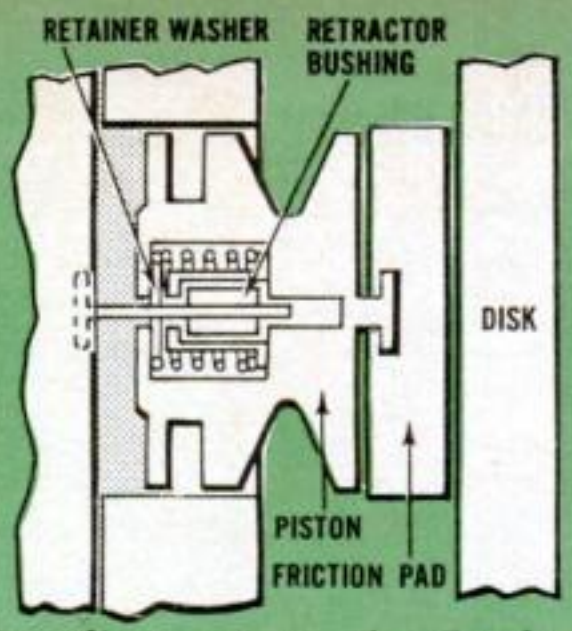


Before disk brakes could be used on U.S. cars, it was necessary to change from solid to ventilated disks and to develop four-, instead of two-piston, calipers.

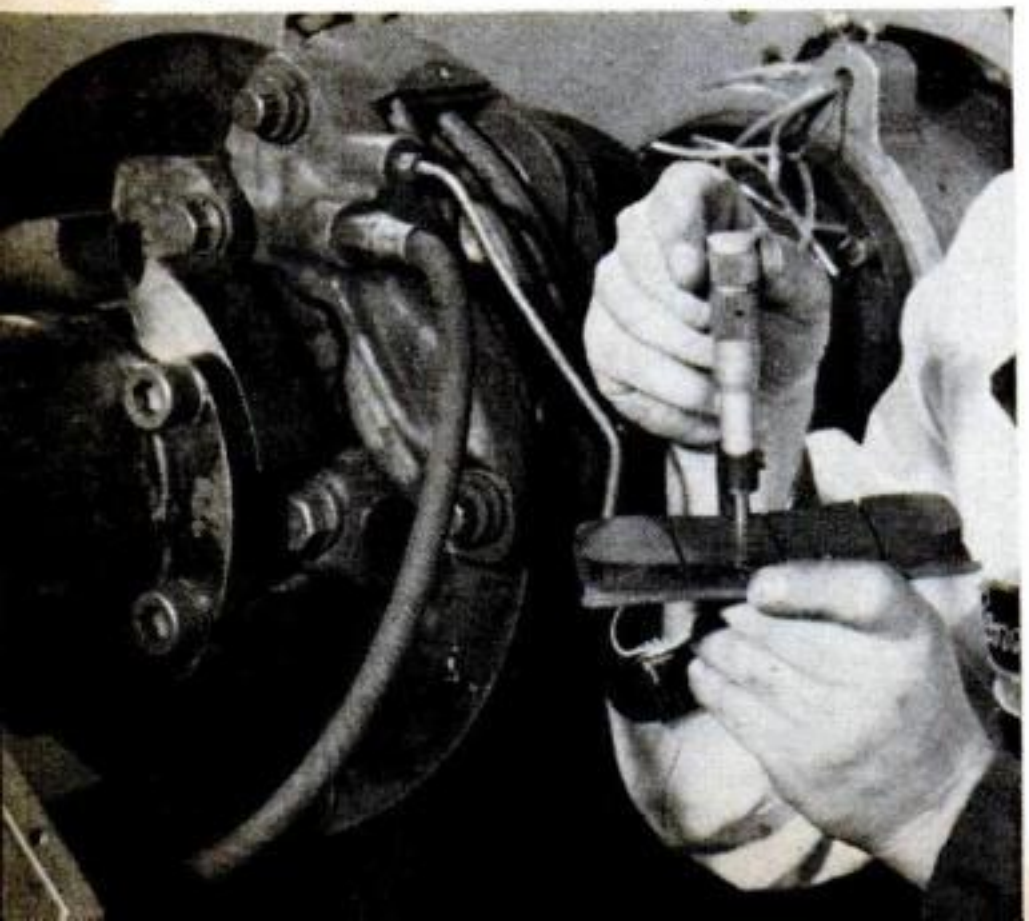




Automatic adjustment on the Bendix disk brake works with a retractor device. Piston moves to the right until the friction pad comes in contact with the disk. The friction ring will change position after wear and re-establish clearance.

Pad replacement on Kelsey-Hayes disk brake is a matter of about two minutes. There is no need to bleed the brake system after relining, and the clearance is automatically adjusted.

Field experience with 80,000 Fords and Lincolns with Kelsey-Hayes front disks shows good results on pad wear. Normal pad life is 40,000 to 50,000 miles, and on some cars, 75,000 miles.



"By 1970," says Rene Vansteenkiste of Budd, "80 percent of all new cars will have disk brakes, on two wheels or four." Al Turner of Chrysler agrees: "The industry is progressing toward four-wheel disk brakes."

Chevrolet stands alone in producing an American car with four-wheel disks. Chevy's Zora Arkus-Duntov explains: "The heavy-duty drum brakes for the Corvette got heavier and heavier . . ."

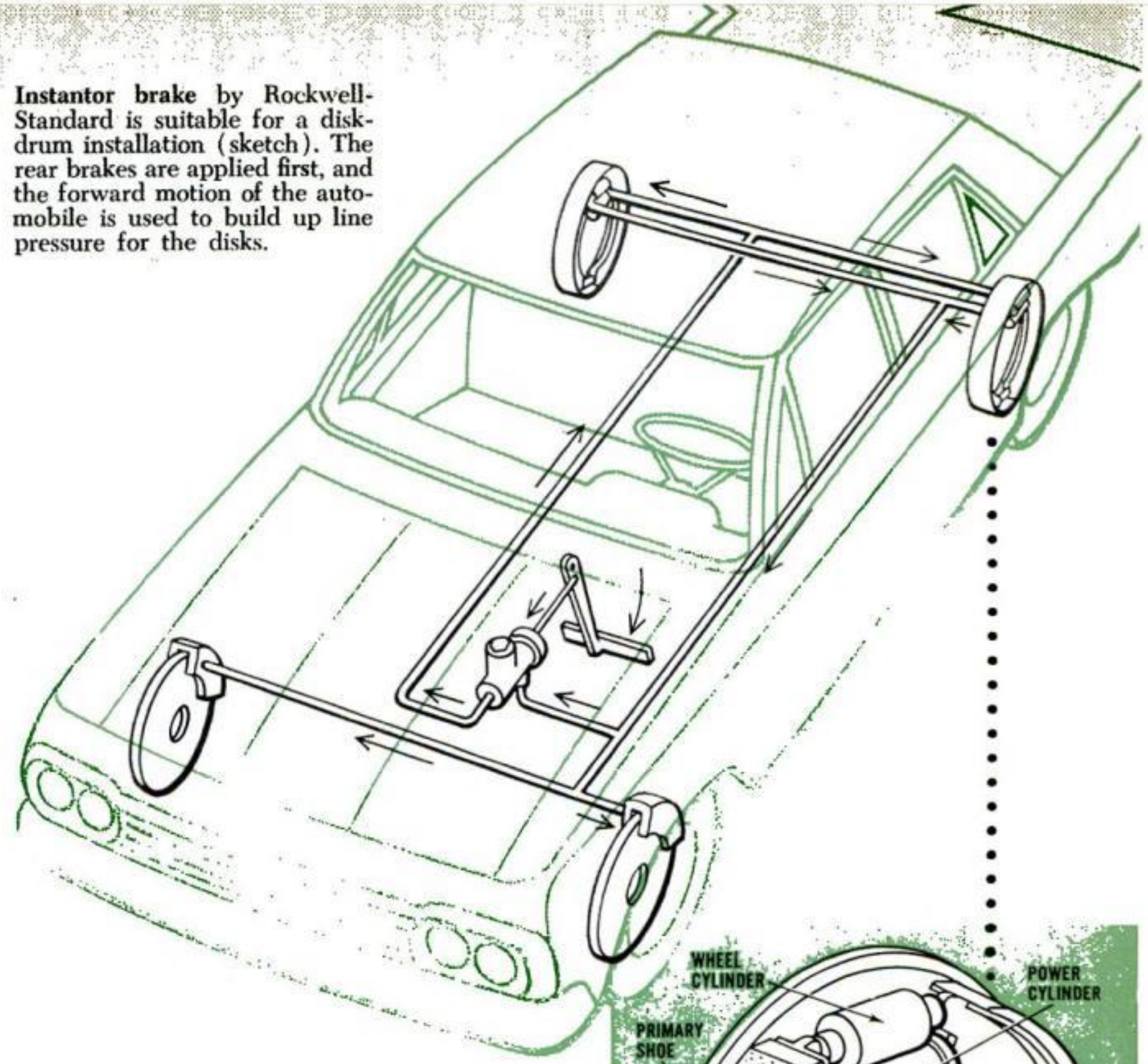
The drum mass and the air flow around it are more important than either lining area or swept area. The brake is a heat engine, transforming the energy of the moving car into heat. It is the heat-absorption and heat-dissipation abilities of a drum that *really* tell you how good a brake is. Cast iron has a high heat-storage capacity and is far cheaper than aluminum. But the bigger and better the brake, the higher the unsprung weight (which means a loss of handling precision). For the limited-production Corvette, four-wheel disks were the answer.

In the past 10 years, the standard drum brake has been developed to do twice the work without any increase in size or weight. Brake engineers are hard at work on further improvements:

- Front and rear drum sizes will be better matched.
- Composite drums, with metal-fu-

Urheberrechtlich geschütztes Material

Instantor brake by Rockwell-Standard is suitable for a disk-drum installation (sketch). The rear brakes are applied first, and the forward motion of the automobile is used to build up line pressure for the disks.



sion problems, are being replaced by full-cast drums.

- Castings will be stress-relieved to improve roundness and balance.
- Machining tolerances will be restricted to reduce out-of-roundness.

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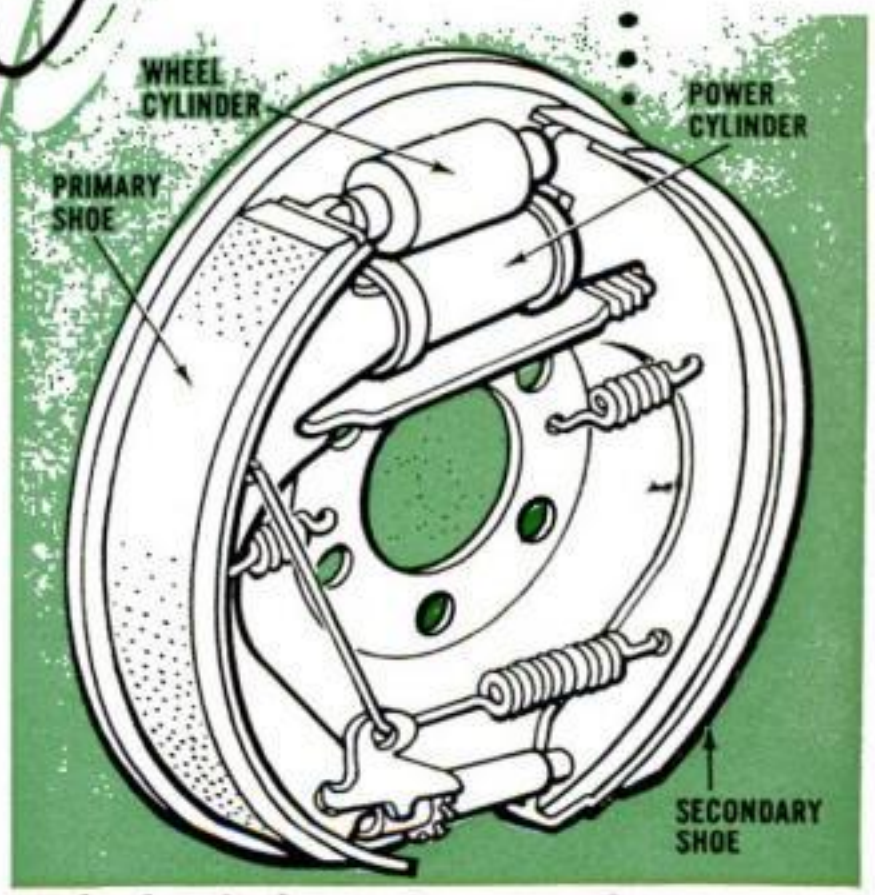
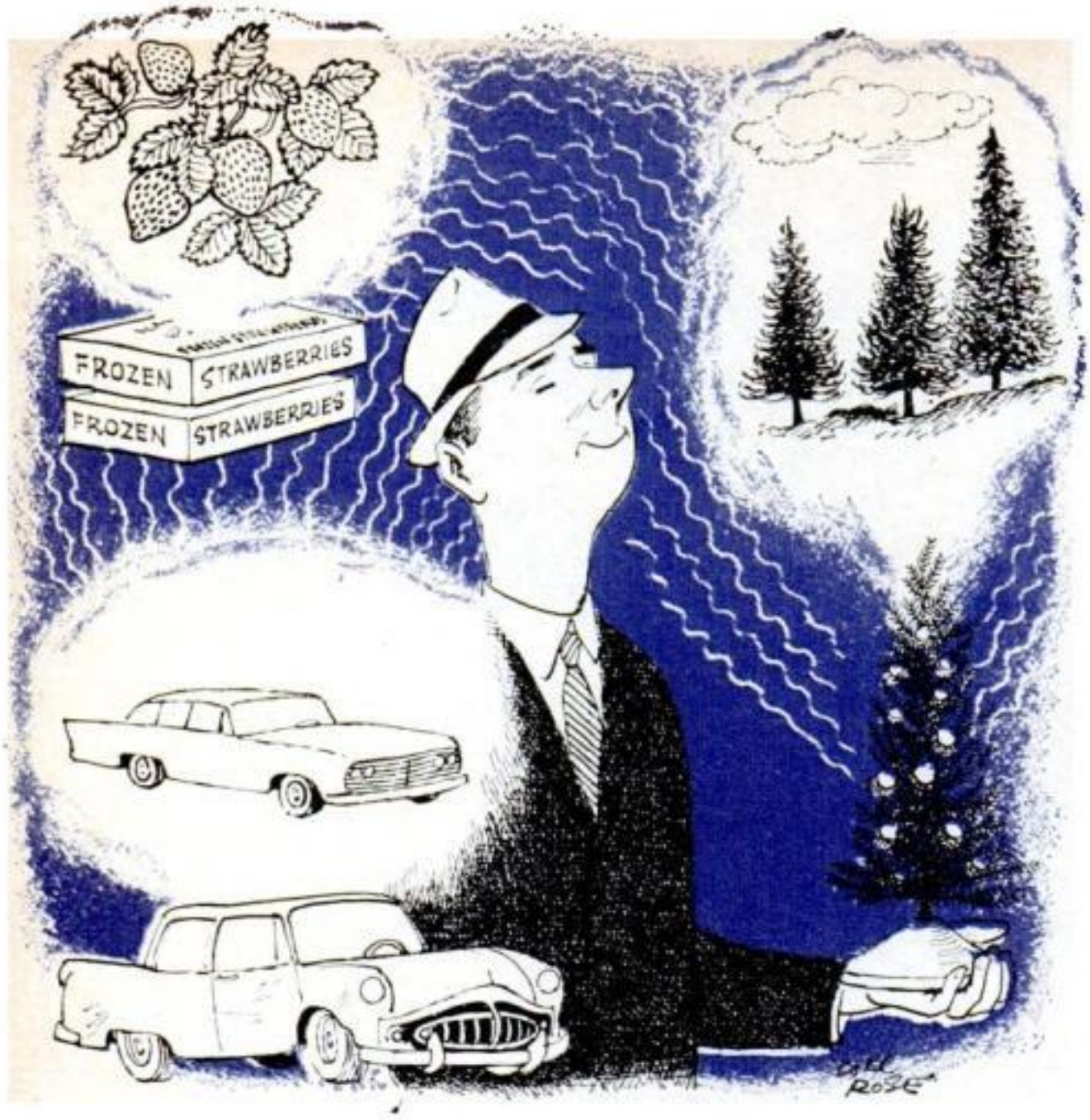


Wheel cylinder in Instantor drum is combined with a power cylinder. The shoes are actuated by the wheel cylinder, and, just as in a duo-servo system, the secondary shoe is energized by being wedged against the drum. The resultant load is brought against the power-cylinder piston, which forces fluid at high pressure to the front disks.

Main beef against drum brakes is poor lining quality. These dangerously inferior linings (left) crumbled and smoldered after only a few miles of severe use.

Urheberrechtlich geschütztes Material



Scientists of the

They're Selling You

Smart manufacturers make you pay through your nose, cashing in on the new science of osmics

By Theodore Irwin

ONE week recently, patrons of a Hackensack, N.J., supermarket were met by a fetching synthetic strawberry aroma wafted through the store. As if drawn by a magnet, many customers followed their quivering nostrils to the frozen-food cabinet and picked up packs of frozen strawberries. By week's end, the stock was sold out.

"These simulated scents are terrific," says Valentine Ruch, the supermarket's purchasing manager. "Customers are sort of pushed into buying." The strawberry-sniffing festival isn't an isolated instance of the uses of smell.

More and more, you're paying through your nose. Last December, if you bought a plastic Christmas tree, chances are it smelled more piney than a grove of Oregon sugar pine. Several major cigarette brands now have odorant filter tips that give you the instant redolence of tobacco, instead of a filter-blocked non-aroma. Your wife may have bought an electric blanket because it has a soft lavender scent or a lighter fluid perfumed with jasmine. You can even buy nylon rope smelling like tarred hemp.

The demand for scent appeal has led to a number of breakthroughs in osmics (the science of smells) in the past few years. Test tubes have brought forth new odorants that remain more stable, resist heat, and linger longer—as much as a year.

"Hot dog" to "fireplace." Behind the trend stand experts known as aroma en-

Urheberrechtlich geschütztes Material

Arthur D. Little Co. have created 8,000 odor compounds, stored in these shelves of bottles.

with Subtle Smells

gineers, whose mission on earth is to delight the human nostrils. Lab-concocted scents are provided by companies that do about $25,000,000 worth of business annually. They have created 30,000 different scents ranging from "hot dog" to "fireplace."

Creating an aroma is an art. Usually scent is a blend of chemicals or natural materials. A "new-car smell," employed by shrewd used-car dealers, consists of banana oil, glues, leather, rubber, gasoline, and plastic scents. A piece of flannel is soaked with the scent and placed behind the seats. One California dealer advertised: "Our second-hand cars look like new, run like new, smell like new."

Odors are also added to raw materials —by means of aromatic pellets—towards the end of a manufacturing process or are sprayed on a wrapping.

How are sales-inducing scents wafted around stores? The Hackensack supermarket used a newly developed Scentomizer. The man responsible for this device is Alfred Neuwald, head of Fragrance Process Co. One of the more versatile of the aroma engineers, Neuwald has actually helped build a better mousetrap, one with a piece of wood saturated with a "cheddar" scent. It works; sales of the smell trap climbed 20 percent last year.

Odors made to order. Neuwald makes newspaper advertising pages smell like maple syrup or roses. For the New York World's Fair, he developed appropriate odors for a Hindu village: curry and cows.

Even our government is getting into the act. Department of Agriculture researchers are trying out scents to make

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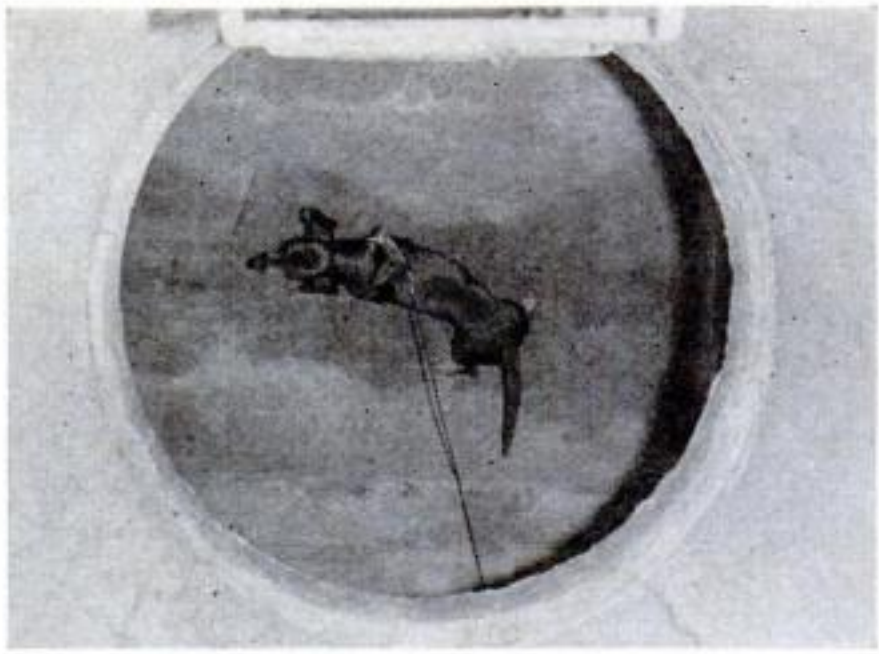
Urheberrechtlich geschütztes Material

Owner holds tape as Gretchen is let into manhole.



Bird's-eye view as she starts trek.

Final reward—an ice-cream cone.

Low-slung surveyor measures drains

If you are walking down the street in Los Angeles and a dog pops out of a manhole, don't be alarmed. It's probably Gretchen. A dachshund, she's one of the most important tools of her owner, Dean Salazar,

Water sled takes jet ride on stilts

A hydro-ski assault craft, this boat skims on retractable skis as a test-bed for the Marines' proposed 70-m.p.h. landing craft for rushing the beaches. Powered by Lockheed-developed turbine-driven water jets, it can retract its skis and ride up onto the beach on a swell with no rudder or propeller to damage. Future hydro-ski landing craft are planned to range up to 100 tons, carry tanks, jeeps, and supplies.

Urheberrechtlich geschütztes Material

Out one pipe, then into another.

At job's end, she comes up for air, tape tied to collar.

Ready for another day—with the rest of the survey party's equipment lined up with her at curb.

survey-party chief for Los Angeles county's flood-control program.

Underground are many miles of narrow drainpipes, a vital network for handling flood waters. For years the flood-control surveyors had faced an almost impossible task of getting tape measures through the pipes. Gretchen, with her short legs, is made for the job. With a tape tied to her collar, she scampers through in no time.

Giant bits drill big holes for underground nuclear tests

The huge drill bit at right—64 inches in diameter (some run up to 160 inches)—makes nine-inch oil drills look like child's tools.

Used by the Atomic Energy Commission to sink vertical shafts for underground weapons tests at the Nevada test site, the big bits dig as deep as 5,000 feet. Miners and equipment then go down to the bottom of the large-diameter shafts to excavate rooms up to 900 cubic yards for shot chambers.

Urheberrechtlich geschütztes Material

Are We Licensing

By James R. Berry

A YOUNG hot-blood in Oregon recently careened down a highway leading to Portland, ran off the shoulder, and catapulted into a hot-dog stand, killing two people. His driving record showed a history of 10 crashes and 94 traffic violations, but he had managed recently to renew his driver's license.

In Pennsylvania, a driver was caught steering his car with one foot while working the accelerator and brake with the other. Unknown to the license bureau, he had lost both arms in an accident. This driver—*like 25 million others* now on the roads—got his license before driver tests were put on the books and never had any sort of examination.

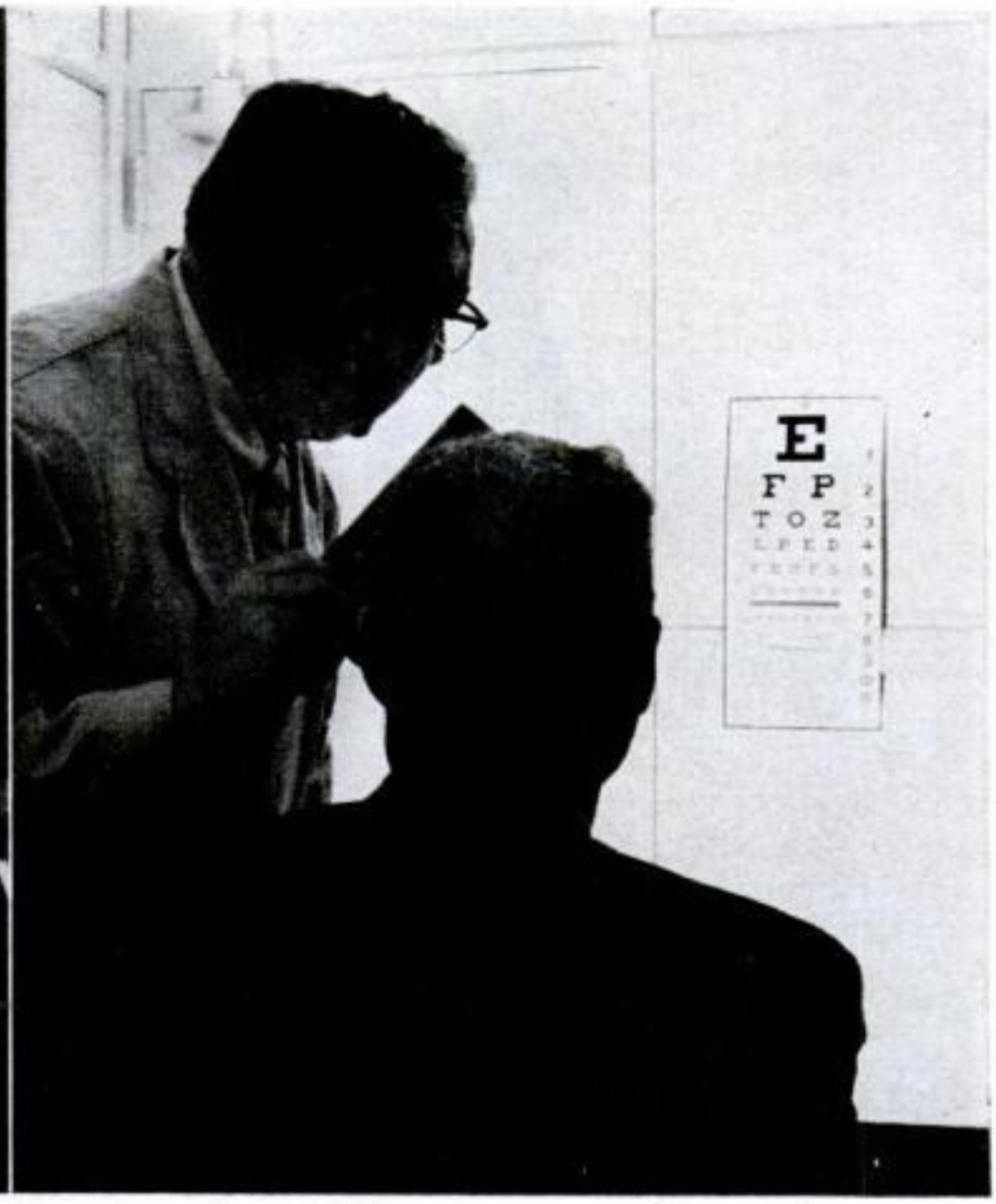
In Indiana, more than 20 people with valid driver's licenses were found also to be receiving pensions for the blind.

These incidents underscore what is probably the most neglected stumbling block to highway safety today: our horse-and-buggy licensing system.

Each year, two million new drivers join the 92 million motorists now clogging U.S. highways. Fatalities are reaching record heights—47,000 in 1964. Driver behavior and negligence contribute to over 90 percent of all accidents.

Driver tests are too easy...

Written examination in most states is on only elementary questions. Overworked motor-vehicle inspectors give it hurriedly. The identity of these applicants is concealed deliberately.



Eye tests, by and large, mean reading a fly-specked wall chart one eye at a time. Anyone wanting to cheat can memorize the chart while standing around waiting for the examination.

Urheberrechtlich geschütztes Material

Drivers to Kill?

Yet our licensing system remains geared to the time of the Model T, hamstrung by lack of interstate cooperation, archaic procedures, and conflicting standards.

Lack of coordination. State laws constitute a clutter of 50 uncoordinated licensing systems with requirements so unequal that a driver who easily passes the examination of one state might be barred from the roads of another.

Some states test a driver's reaction time; most don't. Ten states have no minimum requirements for hearing; the rest have a large variety. Many states allow a driver with physical disabilities to use only back roads or drive at restricted speeds; others allow the same driver on all roads at posted speed limits.

Eighteen states have visual standards below the minimum recommended by the American Optometric Association's Committee on Highway Safety. Although traffic experts warn that peripheral sight is important for safe driving, only 14 states test for it. Despite the fact that the accident rate more than doubles at night, no state tests for resistance to momentary glare-blindness caused by oncoming headlights.

To really count, license examinations should be given by experts with the

CONTINUED

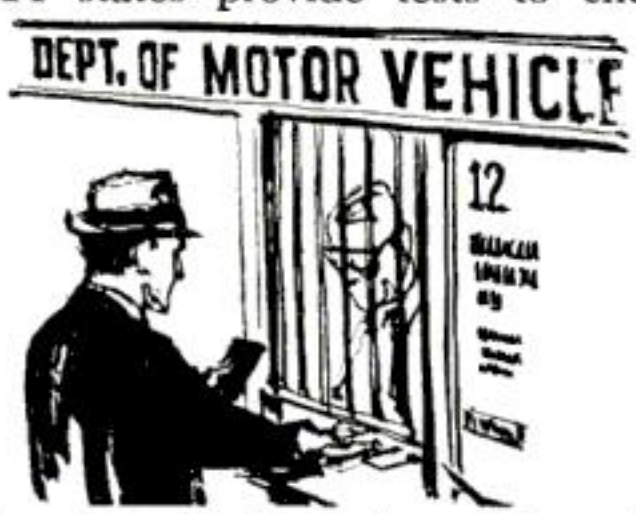
usually this is all there is to it

The driving part frequently consists of going around the block and making a stab at parallel parking. This picture was staged with the help of an officer of the North Carolina Highway Patrol to show the problem. North Carolina, tough on applicants for licenses and renewals, keeps a record of 40,000 licenses that have been either suspended or revoked.

Urheberrechtlich geschütztes Material

Eight ways to improve our system of licensing

1 Standardize driver's tests throughout the 50 states. While peripheral sight is important for today's defensive driving, only 14 states provide tests to check it.



2 Give more independence to motor-vehicle bureaus. Make them self-supporting. Often, licensing is a stepson of another department, with license-fee funds diverted.

3 Coordinate the records of state licensing bureaus in all states; prohibit multiple licensing. A driver who has obtained several licenses can easily escape detection.

4 Get professionals in to run the motor-vehicle bureaus. In some states, the administrators are political hacks. Integrity and knowledge are vital to effective licensing—and reduction of the accident toll.

time and facilities to do the job right. Few states even approach this ideal. License administrators generally agree that an examiner needs about 30 minutes to road-test an applicant fully. Most states allot a scant 15 minutes or less—barely time to fill out forms and park once or twice.

A handful of states have policies that encourage sloppy testing. In Florida, for instance, responsibility for examining drivers lies with the county—with part of the fees legally settling in officials' pockets for their trouble.

Another dangerous fault with the licensing system is the once-in-a-lifetime examination. Physical ability to drive, especially in later years, can deteriorate rapidly. Yet only 21 states regularly test drivers again, once they've got their licenses.

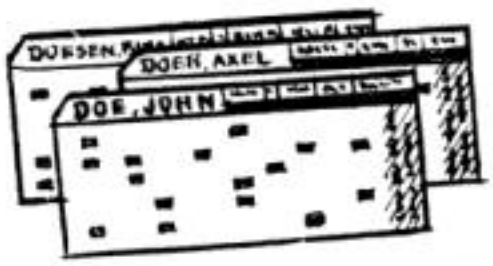
When New Jersey began renewal examinations for drivers over 65 who had a reportable accident, barely one-third passed the test. New York State has just begun testing drivers' vision every nine years. New York State Motor Vehicle Commissioner William S. Hults predicts that 76,000 drivers with vision too poor to be helped by glasses will be taken off the roads.

Effective driver's-license tests are only part of the answer to ridding the highways of hazardous drivers. There's no test to spot the highway kooks, the emotionally unstable drivers.

Multiple-license racket. One of the most flagrant breaches of highway safety is multiple licensing. Thousands of dangerous drivers are still jeopardizing lives because they've been able to spread their accident record thin over several licenses. Getting a good collection is a cinch. Many states will give a license to a new resident without picking up his old one. If someone's license is suspended or revoked, he can usually get another from a neighboring state. Another unscrupulous dodge is renewing the license of a dead driver.

Urheberrechtlich geschütztes Material

5 Retest drivers periodically. Only 21 states test again, after initial test, to determine deterioration of driving ability.



6 Establish a statistical office to keep nationwide permanent records of driver convictions for violations and accidents.

7 Test emotional stability of applicant where suspicion is aroused—an extension of standardized testing procedures.

8 Foster more cooperation among MVBs, courts, and the police. The stern court, with a culprit's previous record before it, can encourage the MVB and the patrolman to crack down hard on the dangerous, incompetent driver.

One more hitch in keeping tab on hazardous drivers stems from the way state motor-vehicle bureaus keep their records. To crack down on steady violators, the MVBs have to know what they've done—and how often. But most state bureaus, overworked and understaffed, keep each driver's dossier inefficiently by hand.

Yet another snag: MVBs often don't even hear about convictions.

"Sometimes a state has a good reporting law for getting convictions into a driver's-license file," says Glenn Carmichael, Executive Director of the American Association of Motor Vehicle Administrators (AAMVA). "But sometimes there are cities in a state that don't submit conviction reports."

In other cases, teen-age traffic violators are tried in juvenile courts that don't release the names of minors, leaving the MVB powerless to act. "Hardship" laws allow motorists whose licenses have been revoked to drive if they need their car for work, a policy condemned by the AAMVA.

Hope for the future? In the last few years, however, there have been signs that our chaotic licensing systems may be moving to catch up with the 20th century. North Carolina, New York, and a handful of other states now use computers to keep track of driver records. Follow-ups on accident repeaters take a fraction of the time they used to. To some extent, many states are cooperating with each other by collecting one license when issuing another to new residents, and by hitting violators with penalties when other states report infractions in their jurisdiction.

Still another encouraging sign is the increasing importance of the National Driver Register Service, an agency set up by the federal government in 1961. Before a state issues a license to a new resident, it can check with the Register. All states will use the Driver Register and forward conviction reports. ■ ■

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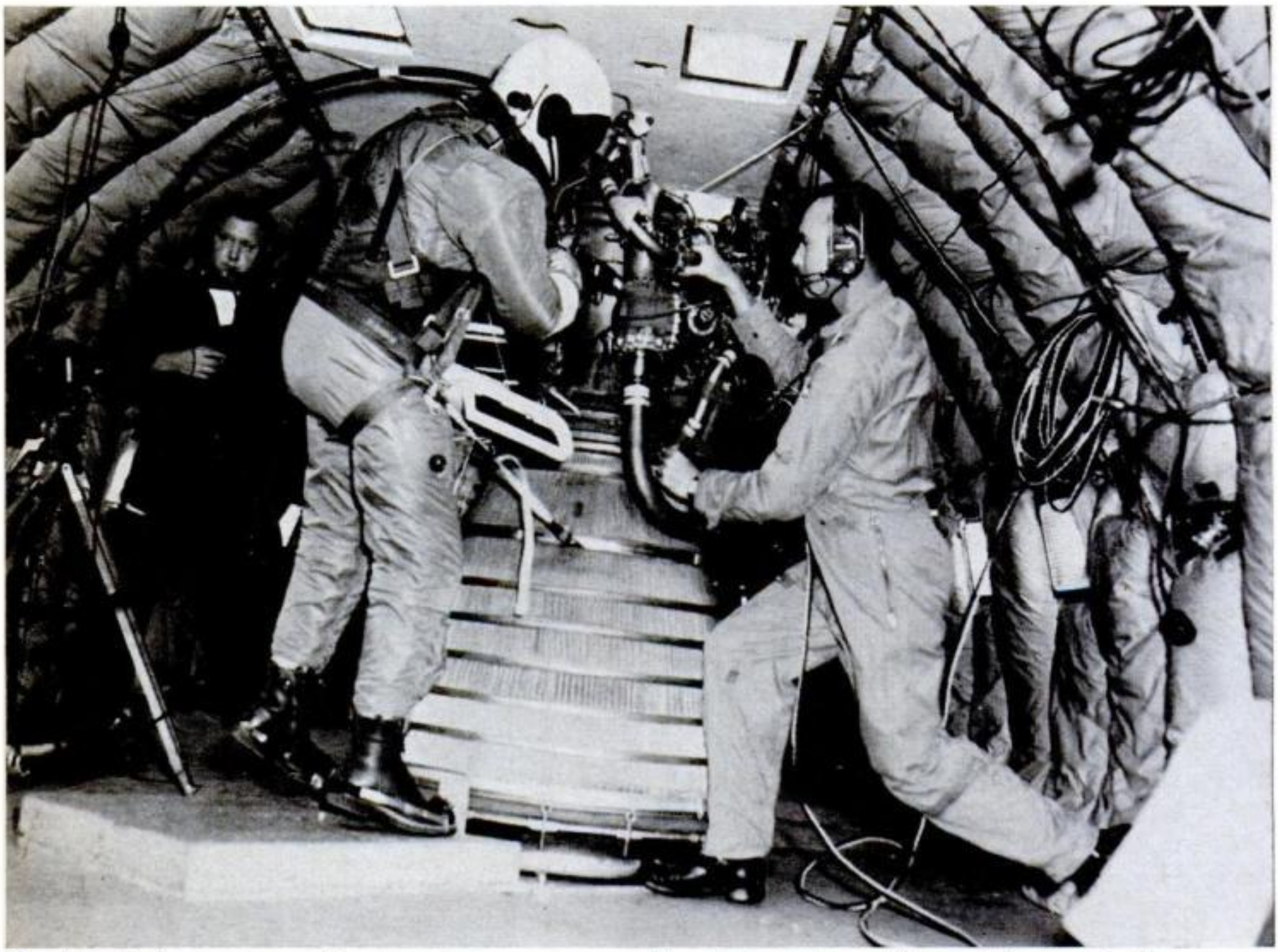
How space voyagers will live in—

The Strange World of



In plane flying zero-gravity course, spacemen repair rocket engine with special space tools.

Keeping a meal from floating away, avoiding jet-propelled sleepwalking, going outdoors as a human satellite—these are problems now being solved

By Dr. Wernher von Braun

Director of NASA's George C. Marshall Space Flight Center, Huntsville, Ala.

WHEN an astronaut becomes a human satellite, floating freely in the vastness of space, he offers a dramatic example of the weird things that can happen in the realm of zero gravity—a strange world just beginning to be explored.

In the Soviet space flight of last March 19, Lt. Col. Alexei Leonov left his orbiting Voskhov 2 spacecraft and sailed along beside it for 10 minutes, at nearly 18,000 m.p.h., before returning along his trailing lifeline.

His eerie experience will be shared,

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Zero Gravity

within only a few months, by our own spacemen. In one of the next Gemini flights an astronaut is to emerge from his orbiting capsule—and possibly perform a simulated repair on its exterior with a special space tool. Before that, a Gemini astronaut will have made the preliminary trial of opening the spacecraft's hatch and venturing halfway out.

Dr. von Braun, pointing to viewing screen in Cape Kennedy blockhouse, watches successful launch of Pegasus satellite by Saturn rocket.

What is zero gravity? Subject to this strange environment is any spacecraft coasting unpowered through space—around the earth, or on the way to the moon or a planet. Inside the craft as well as out, space voyagers find the familiar law of gravity apparently repealed. Any loose objects, astronauts included, will float about instead of staying put in seats or receptacles.

Actually, zero gravity or weightlessness does not mean at all that gravity has ceased to operate. It results, rather, from a situation where both the spacecraft and its contents can freely follow the identical forces of gravity. Once a spacecraft has been "injected" into any kind of unpowered trajectory in a vacuum, its hull, its crew, and its contents will faithfully obey the laws of motion governing all heavenly bodies—and so, there can be no relative forces between them. Living and housekeeping under zero gravity, therefore, pose curious problems:

Jet-propelled sleepwalkers. Before going to sleep, astronauts will need to strap themselves down, or they would float about the cabin, propelled by the thrust of their own breath.

Sponge baths, rather than showers, must be the style for bathing under zero gravity.

Like babies, astronauts will drink from squeezable plastic bottles. If a spaceman tried to get water out of an ordinary bottle, it would be like the problem you encounter when you try to pour catsup on your hamburger—first you get none, then more than you want.

For short trips, food for astronauts will be taken along in dehydrated form. Water will be injected into the plastic food bag and, after a bit of kneading, the astronaut will squeeze the resulting creamy substance into his mouth by pulling the bag through his closed teeth.

It is interesting to note that astronauts have no difficulty in swallowing under zero-gravity conditions. The esophagus is equipped with a series of ring muscles that force the food down to the stomach, regardless of the presence or absence of gravity. This action is so effective that it even works *against* gravity: You can eat while standing on your head!

Longer trips will call for more comfortable ways of eating. As a minimum, astronauts will want warm food of the "add water, heat, and serve" type.

For planetary voyages lasting several hundred days, you can rest assured that it will be shrimp cocktail, filet mignon, Waldorf salad—the works. Spacecraft pantries will have more or less conventional deep-freeze compartments, infra-

[*Continued on page 198*]

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The Space Race: Who's Ahead?

RECENT feats in manned space flight have once more highlighted the space race. The Russians started with bigger booster rockets, giving them ability to orbit heavier spacecraft, so many experts think the Soviet Union is ahead in manned space flight, while we are ahead in the technology of scientific space research. This box score of major events in the Space Era may help you decide for yourself.

SOVIET UNION	UNITED STATES
1957 **Sputnik 1** launched Oct. 4; first man-made satellite. **Sputnik 2,** orbited Nov. 3, carried first passenger, the dog Laika, who died in space.	**1957** First attempted **Vanguard** satellite launch failed when booster exploded on the pad, Dec. 6.
1958 Little known activity; **Sputnik 3,** launched May 15, transmitted scientific data from space.	**1958** **Explorer 1,** first U.S. satellite, orbited Jan. 31. Data from this and other Explorers revealed existence of the Van Allen radiation belts. U.S. launched seven satellites successfully, had 10 failures.
1959 First successful lunar probes: **Lunik 1** missed the moon, but **Lunik 2,** launched Sept. 12, was first to hit the moon, and **Lunik 3** (Oct. 4) circled the moon and transmitted first photos of its hidden back side. Luniks showed precise control of rockets, sophisticated instrumentation.	**1959** U.S. launched 11 successful satellites, had eight failures. **Scientific satellites** returned data on earth's magnetic field and radiation belts, took first TV photo of earth, counted micrometeorites.
1960 **Sputniks 4** (May 15) and **5** (Aug. 19) were unmanned tests of the Vostok space cabin; the latter carried two dogs, Belka and Strelka, recovered alive from space. Two dogs in **Sputnik 6** died when the spacecraft they were riding in burned up during reentry. Russia's first two Mars probes failed to orbit.	**1960** 16 satellites were launched successfully, 13 failed. Successes included first communication satellites, the **Echo 1** balloon (Aug. 12), and **Courier 1B** (Oct. 4)—the first "active repeater" comsat. **Tiros 1,** first weather satellite to photograph earth's cloud cover, was launched Apr. 1. Launches of classified **military satellites** began, and the first information-bearing capsules were recovered from space.
1961 **Vostok 1,** launched Apr. 12, placed first man in orbit, Yuri Gagarin, who landed after one orbit. **Vostok 2** (Aug. 6) carried Gherman Titov for 17 orbits, a flight of over 25 hours. Vostoks weighed 10,400 pounds, were lifted by a rocket of 800,000 pounds' thrust. Other launches were unmanned Vostok tests; and two Venus probes, which failed.	**1961** In a test of the **Mercury** space cabin, Enos the chimp was recovered after three orbits, Nov. 29. First manned Mercury flights (suborbital): Alan Shepard, May 5; Virgil Grissom, July 21. First two Ranger moon probes failed. U.S. launched **29 scientific, weather, and military satellites;** had 12 failures. First launch of a stage of the **Saturn** booster, ultimately to have 7½-million-pound thrust, Oct. 27.

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SOVIET UNION

1962 "Space twins" Andrian Nikolayev and Pavel Popovich circled the earth for 91 and 71 hours, respectively, in **Vostoks 3 and 4,** launched Aug. 11 and 12; after launch, Vostok 4 was only 3.1 miles from Vostok 3, demonstrating potential rendezvous ability through precise launch timing and control of orbit. The **Cosmos series** of scientific and military satellites began with Cosmos 1 (Mar. 16); 12 Cosmos satellites in 1962. Russia also had three Venus-probe failures and three Mars-probe failures.

1963 Second "group flight": **Vostok 5,** launched June 14, carried Valery Bykovsky around earth for 34 hours while **Vostok 6** was launched June 16 carrying Valentina Tereshkova, first woman in space, who stayed up for 119 hours. **Polyot 1,** said to be first remote-controlled maneuverable satellite, was launched Nov. 1. **Cosmos series** continued with 12 more launches.

1964 Three men in a **Voskhod 1** went into space Oct. 12, orbited for 24 hours; along with pilot Vladimir Komarov, this first multi-manned spaceship carried first scientists in space, physician Boris Yegorov and engineer Konstantin Feoktistov. Voskhod, weighing 16,000 pounds, was launched by improved booster with thrust of 900,000 pounds. Mars-probe **Zond 2,** launched Nov. 30, was heading successfully toward Mars. **Cosmos satellites**—27 in all—were launched, plus five other scientific satellites.

1965 Aleksei Leonov became first man to step out and float in space for 10 minutes when he left the airlock of **Voskhod 2,** launched March 18; he and his companion, Pavel Belyayev, spent 24 hours in orbit.

UNITED STATES

1962 John Glenn became first U.S. astronaut to orbit the earth when his **Mercury** capsule completed three orbits, Feb. 20. Scott Carpenter made three orbits in **Mercury** shot, May 24, Walter Schirra six orbits on Oct. 3. Mercury capsules weighed some 4,250 pounds, were launched by Atlas booster with 360,000 pounds' thrust. **Mariner 2,** successful Venus probe, launched Aug. 26, passed within 21,594 miles of Venus in December. **Ranger 4** (Apr. 23) became first U.S. lunar probe to hit moon, but instruments failed to send back data. **Telstar 1,** communication satellite, was launched July 10. U.S. had 52 successful satellite launches, only seven failures.

1963 Gordon Cooper made 22 orbits lasting 34 hours in the final **Mercury** flight, May 15. **Syncom 2,** first successful "hovering" communication satellite, was launched July 26 and placed in a synchronous orbit 22,300 miles up; a second **Telstar** was also launched. **Atlas-Centaur 2** launch, Nov. 27, was first successful test of a high-energy liquid-hydrogen-fueled rocket, the Centaur stage. U.S. had 37 successful launches, nine failures.

1964 After 15 previous lunar probes had been complete or partial failures, **Ranger 7,** launched July 28, sent back the first close-up TV shots of the moon's surface. **Mariner 4** Mars probe went on its way, operating successfully, Nov. 28. U.S. had 54 successful launches of scientific, weather, communication, and military satellites, and five failures.

1965 In the first manned **Gemini** flight, Mar. 23, Virgil Grissom and John Young orbited the earth three times. Gemini craft was completely under pilots' control and demonstrated limited maneuverability—changes in orbital angle and altitude. U.S. also had continued success in obtaining close-up TV shots of the moon with **Ranger 8** (Feb. 17) and **Ranger 9** (Mar. 21).

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John Martinkovich's hands overcome the language barrier in teaching Tunisian mechanics.

A plea for trained hands from Director Sargent Shriver

There is nothing that the developing nations need so much as people with trained hands who can pass along their skills to others. The Peace Corps has always been composed of people who can do things: fix a car, drive a nail, or hit a baseball. Do-it-yourself types are needed overseas because there is no one else to do it. In return, the Peace Corps gives a person an opportunity to live and work in a culture different from any he has known.

The Peace Corps is the working man's Rhodes Scholarship. It can take a person to any of the 46 countries around the world where we are working. The only requirement is that a person have a skill and a desire to share it with others.

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Wanted: Skilled Hands for the Peace Corps

Why settle for dream castles when you might be building roads, bridges, dams?

By Herbert Shuldiner

THE cyclone roared in off the Bay of Bengal. Its twisting winds battered down homes. Then came torrential rains, drenching and drowning the wreckage and hapless inhabitants. When the winds died away, the district of Chittagong in East Pakistan lay in ruins. About 10,000 inhabitants were dead. Fewer than one in 10 homes were standing.

Authorities in the village of Kumira, where 200 had drowned, turned to a young American Peace Corps volunteer, Roger Hord of Portland, Ore.—not an engineer, or even a college man—and asked him to rebuild the community.

This may not be a typical request to a Peace Corps-

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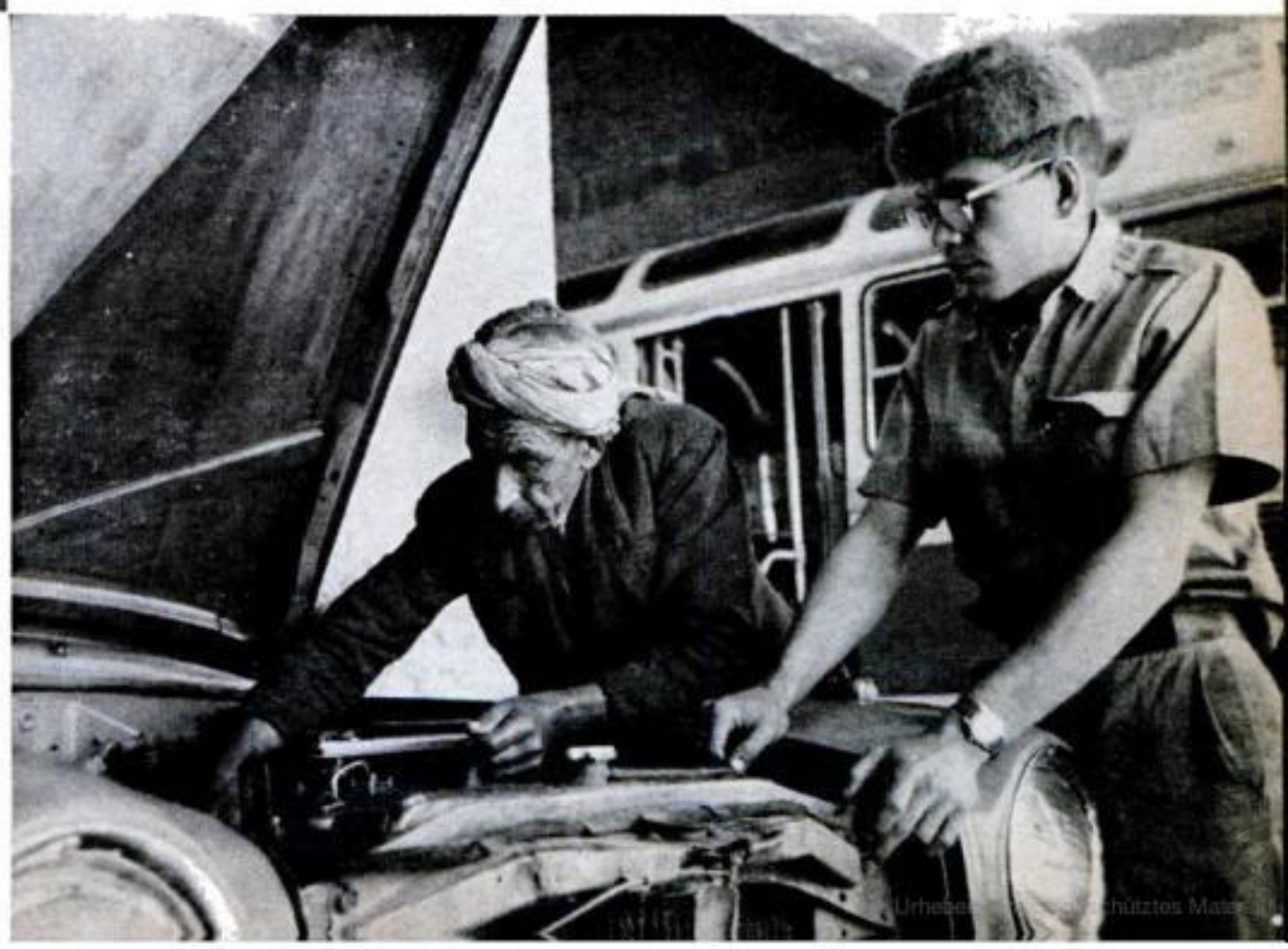

Frank Brechin of Grand Rapids, Mich. (right), helps keep a fleet of trucks owned by the Afghanistan government running by teaching mechanics basic maintenance. Brechin is one of the few Peace Corpsmen to come in contact with Russian technicians who are active in the Asian country.

"You name the skill and we're looking for it," says an official.

man. But it's one of many big jobs 46 foreign nations have asked American volunteers to do.

Hord was a bricklayer, with considerable construction experience. But this job called for erecting homes without bricks, or even a good substitute. The available laborers were without food or water. Too dazed to work, they hadn't even gotten around to burying their dead.

Hord rallied the survivors, cleared building sites, scrounged for bamboo and rain-soaked thatch grass for construction materials. He supervised the setting up of temporary kitchens, and sank shallow tube wells to get fresh water.

In three weeks, Hord and seven other volunteers built 172 homes and two schools. What's more, his planning, and the instruction of Pakistanis in bricklaying (when it was again possible to get bricks) and other construction crafts, led to rebuilding Kumira into the model community it is today.

Hord left Pakistan soon after. He had gained fluency in a new language and exposure to an ancient culture. His work also had given him administrative experience he expects to use in a new career. Today he's studying labor relations at Portland (Ore.) State College.

Not all Peace Corps volunteers have this much responsibility thrust upon them, but others are providing vital skills needed to build bridges, roads, dams—even towns. And the need for these volunteers is growing.

Who's wanted. "You name the skill and we're looking for it, with very few exceptions," says Frank W. Erwin, the Peace Corps' deputy director of recruiting. "We need plumbers, mechanics, electricians—even the guy who only did it during summer vacations."

The Peace Corps needs men for projects in 46 countries, Erwin says. Many of these nations request skills that call for college degrees—engineers, teachers, doctors, dentists. About 75 percent of Peace Corps volunteers actually have college degrees.

But he emphasizes that a carpenter who has never seen the inside of a college may be just as qualified for an important post.

Students at a Tunisian farm school learn to repair a tractor under volunteer Gerhart J. Wehrbein of Burchard, Neb.

Age requirement: from 18 up

The Peace Corps is open to any American citizen over 18. There is no upper age limit. The average age of volunteers is 24½, but a 79-year-old sanitation engineer is now serving in Pakistan. If you are married, your wife must volunteer also, but anyone with dependents under 18 is ineligible.

Step by step, here's what it takes to join the Peace Corps:

- Fill in a questionnaire which you can get from your local Post Office, or the Peace Corps, Washington, D.C. 20525.
- Take the Peace Corps placement test. Except for the language-aptitude part, you can't fail the test. There is no passing grade. The test and the application merely help the Peace Corps evaluate your overall fitness to be a volunteer.

You don't have to know a foreign language—but you must have the ability to learn one. The placement test gives you words from Kurdish to study for 10 minutes. Then you answer questions about the words. If you can pass this test, the Peace Corps will teach you the language of the area you'll be assigned to.

You must be in good health.

If you're accepted, you'll spend the first three months of your two-year enlistment in a training program where you get 36 hours of language instruction a week, teacher training in your primary skill area, and courses in American history and communism. You're also taught the customs, history, and traditions of the country to which you'll be assigned.

How tough is the training? Four out of five who start the course go overseas. Those the Corps feels can't make it are dropped. Others drop out voluntarily.

When the course ends, you get 10-days' home leave before traveling to your assignment. As a volunteer you don't live luxuriously overseas. But you can live comfortably.

The Peace Corps pays you a subsistence allowance, ranging from $55 a month in Nepal to $200 per month in

[Continued on page 208]

Volunteer Harry Haywood of Taberg, N.Y., shows a Cameroon native how to cut a road through the thick jungle brush.

Eugene Schreiber of St. Louis teaches Tanganyika public works officials basics of civil engineering and road building.

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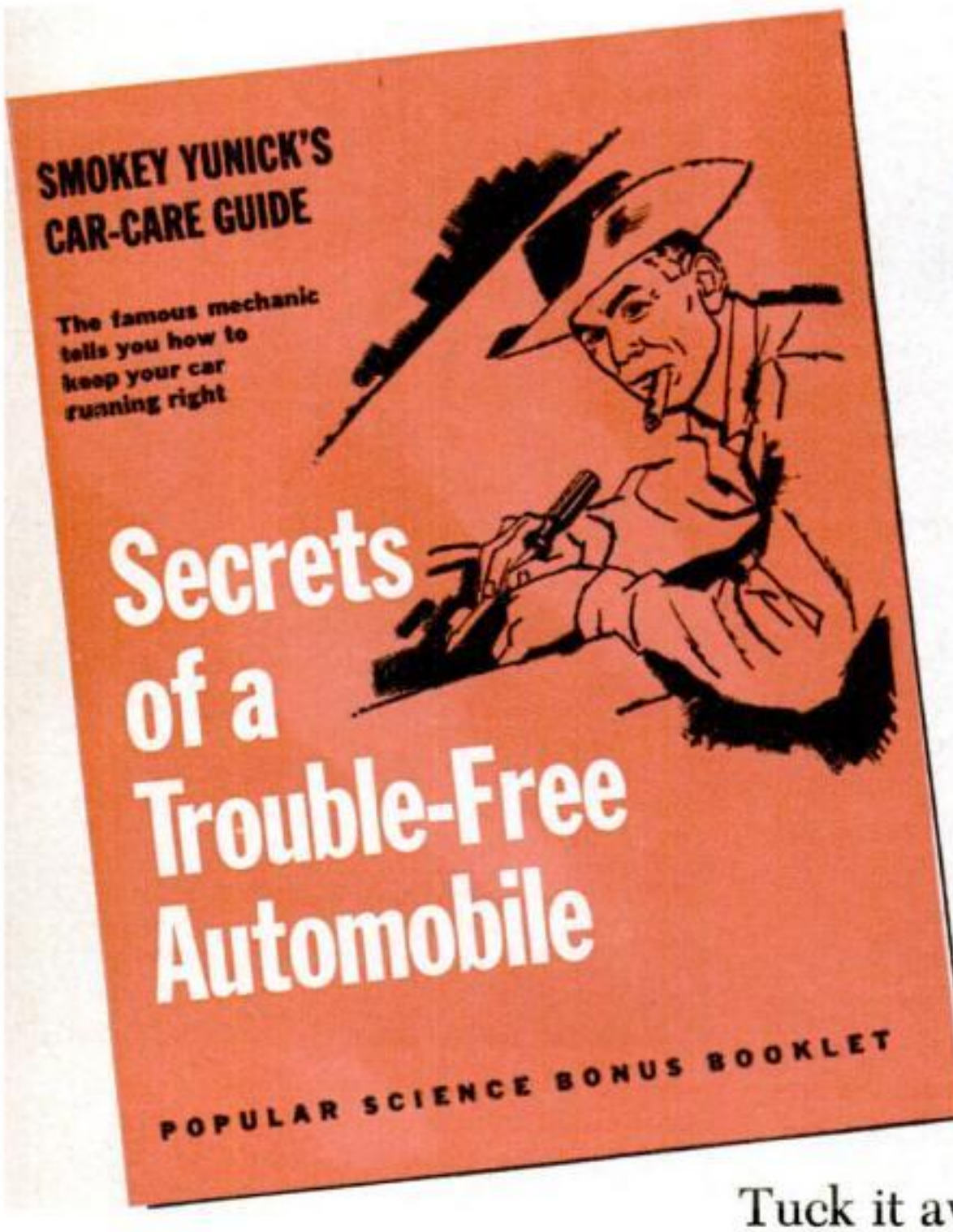
Facing this page is one of the most valuable bonus booklets ever issued by this magazine


SMOKEY YUNICK'S
CAR-CARE GUIDE
The famous mechanic tells you how to keep your car running right
Secrets of a Trouble-Free Automobile
POPULAR SCIENCE BONUS BOOKLET

Read it!

This booklet has been written by America's most famous mechanic. Each month in his popular column "Say, Smokey—" he advises PS readers on car problems.

Save it!

Tuck it away in the glove compartment of your car. As an aid to keeping your automobile in tip-top shape, it will add to your motoring pleasure and help you keep little troubles from becoming big ones.

TO REMOVE the booklet, place your left hand on this page, grasp the booklet with your right, and pull it gently away. Or you can slip a rubber band around the part of the magazine behind the booklet and, by lifting the rubber band, slit the edge neatly (sketch at left).

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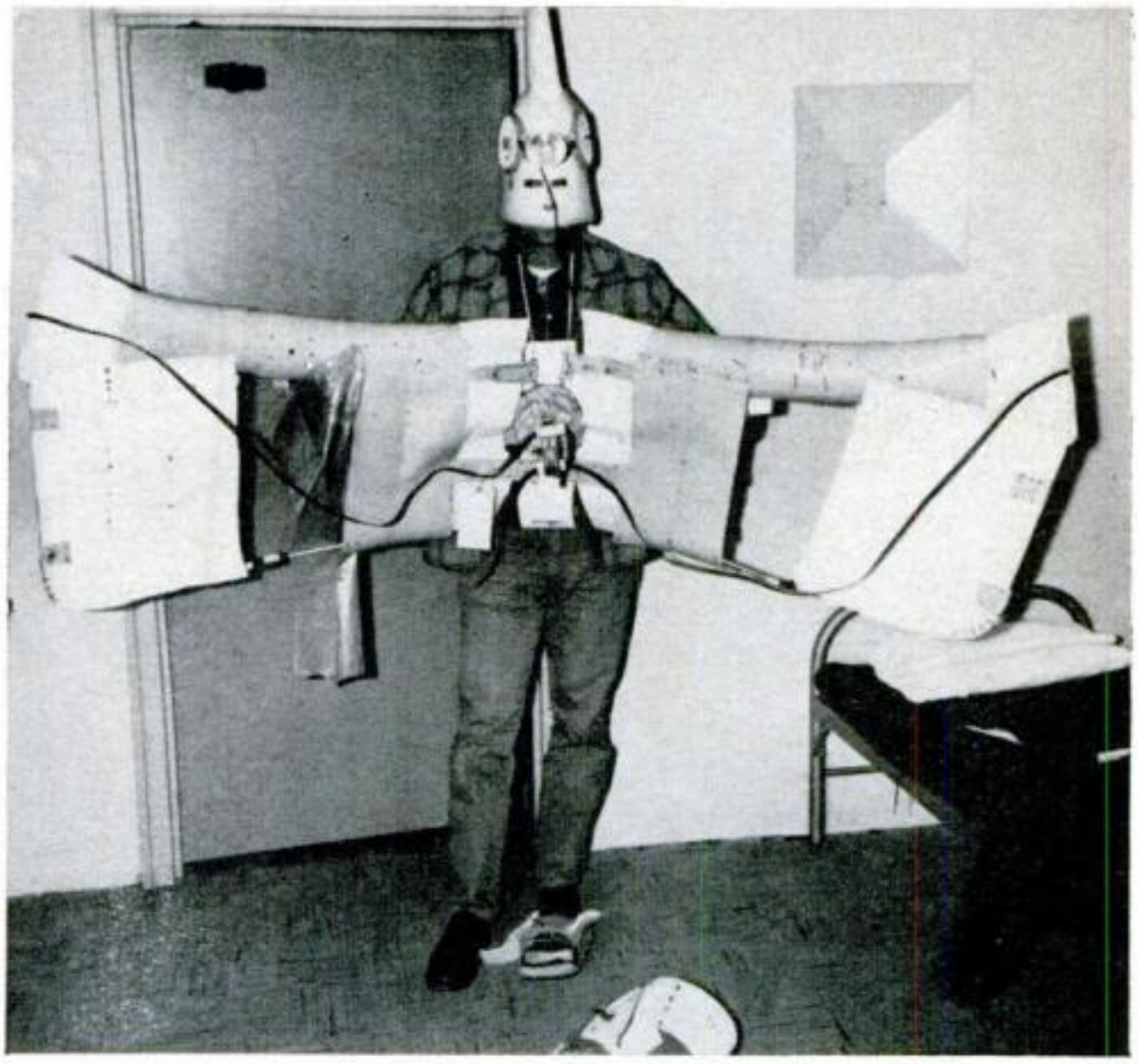
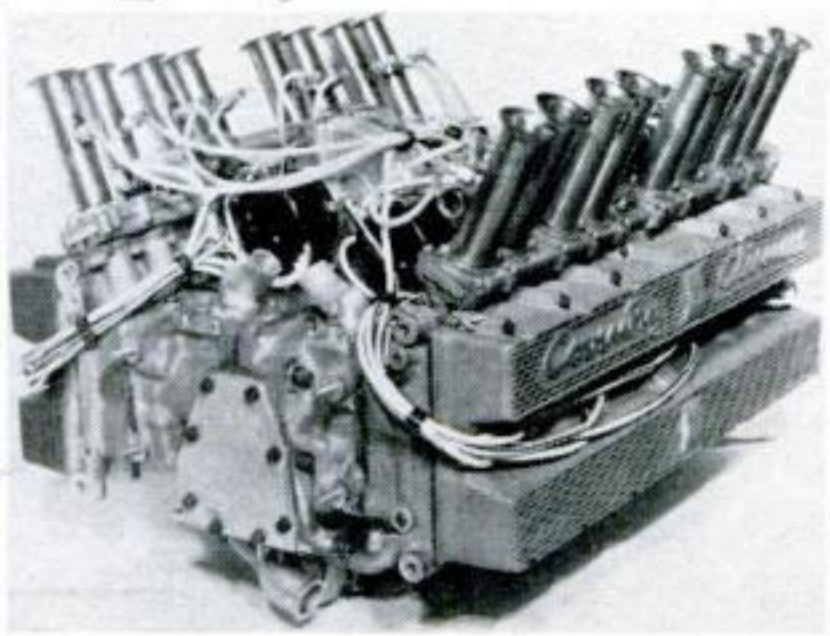
Wing-flapping flying machine for solo flights

Merely posing for cameras, and definitely not set for take-off, California Sheriff Thomas Kelly, at right, shows the latest thing in ornithopters.

The one-man flying machine was created from plastic bleach bottles by a resident of the county.

The sheriff seized it—along with the winged shoes and helmet—"in the interest of the inventor's safety."



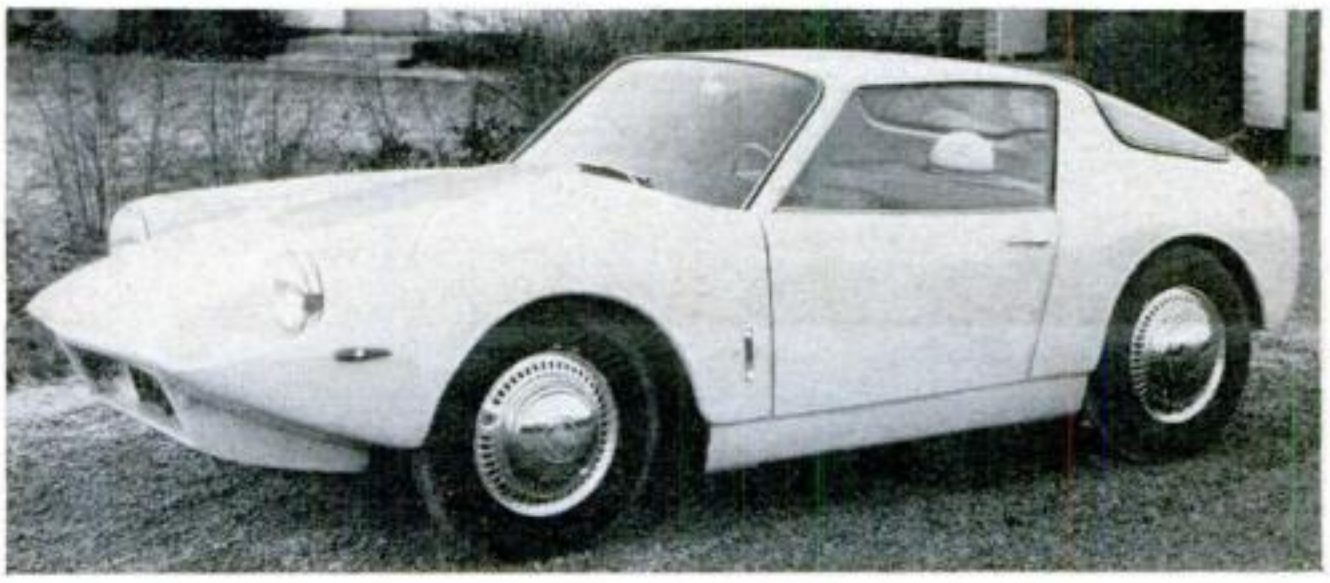


Flat-16 racing engine puts out 220 hp.

This new racing engine, displacing only 90 cu. in., spins out 12,000 r.p.m. to deliver over 220 hp. Made by Coventry Climax, Jaguar subsidiary, the flat-16 has 10 percent more power than their Formula 1 racing V-8.

Acting like opposed-piston flat-eights, its two sections have individual cylinder heads, fuel pumps, and distributors. There are two crankshafts phased 90 degrees apart and joined at the inner ends by a spur gear. This drives a separate output shaft that extends through the crankcase to the clutch. Gas is injected and ignition transistorized.

Sassy Saab aims at U.S. sportsmen



The sawed-off Swede at right is a new Saab for U.S. sports-car sales. The prototype is designed to the requirements of American distributors; production models will differ only in detail.

A stub-tailed fastback on a seven-foot wheelbase, it has a standard 51-cu.-in. three-cylinder, two-stroke engine pepped to 60 hp. for front-wheel drive at top speed of 100 m.p.h. The body will be fiberglass.

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THE BULB TURBINE

TO POWERHOUSE

10,000-KW. GENERATOR

HYDRAULIC TURBINE

VARIABLE-PITCH BLADES

HIGHWAY ATOP BARRIER

SUPPORTING AND WATER-GUIDING VANES

River side

Bulb turbine of radical new design (above) is one of 24 that will generate impressive total of 240,000 kw. in France's new tidal powerhouse (below) at mouth of Rance River on English Channel. Turbine and generator coupled to it occupy a 50-foot-long bulb suspended in water tunnel.

GALLERY

GATE

GATE

BULB TURBINE

THE POWERHOUSE

DIRECTION OF FLOW WITH TIDE RUNNING OUT

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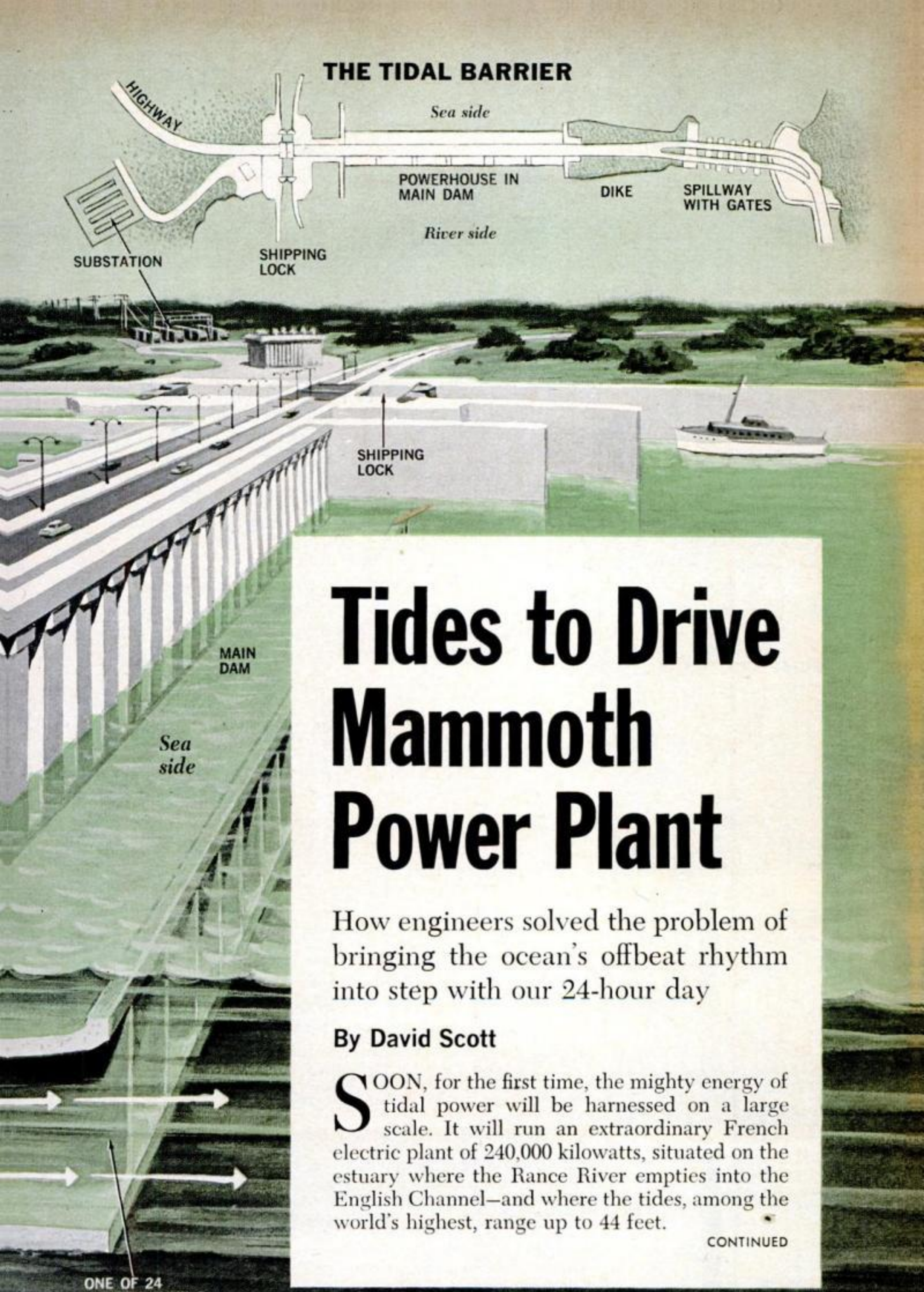

Tides to Drive Mammoth Power Plant

How engineers solved the problem of bringing the ocean's offbeat rhythm into step with our 24-hour day

By David Scott

SOON, for the first time, the mighty energy of tidal power will be harnessed on a large scale. It will run an extraordinary French electric plant of 240,000 kilowatts, situated on the estuary where the Rance River empties into the English Channel—and where the tides, among the world's highest, range up to 44 feet.

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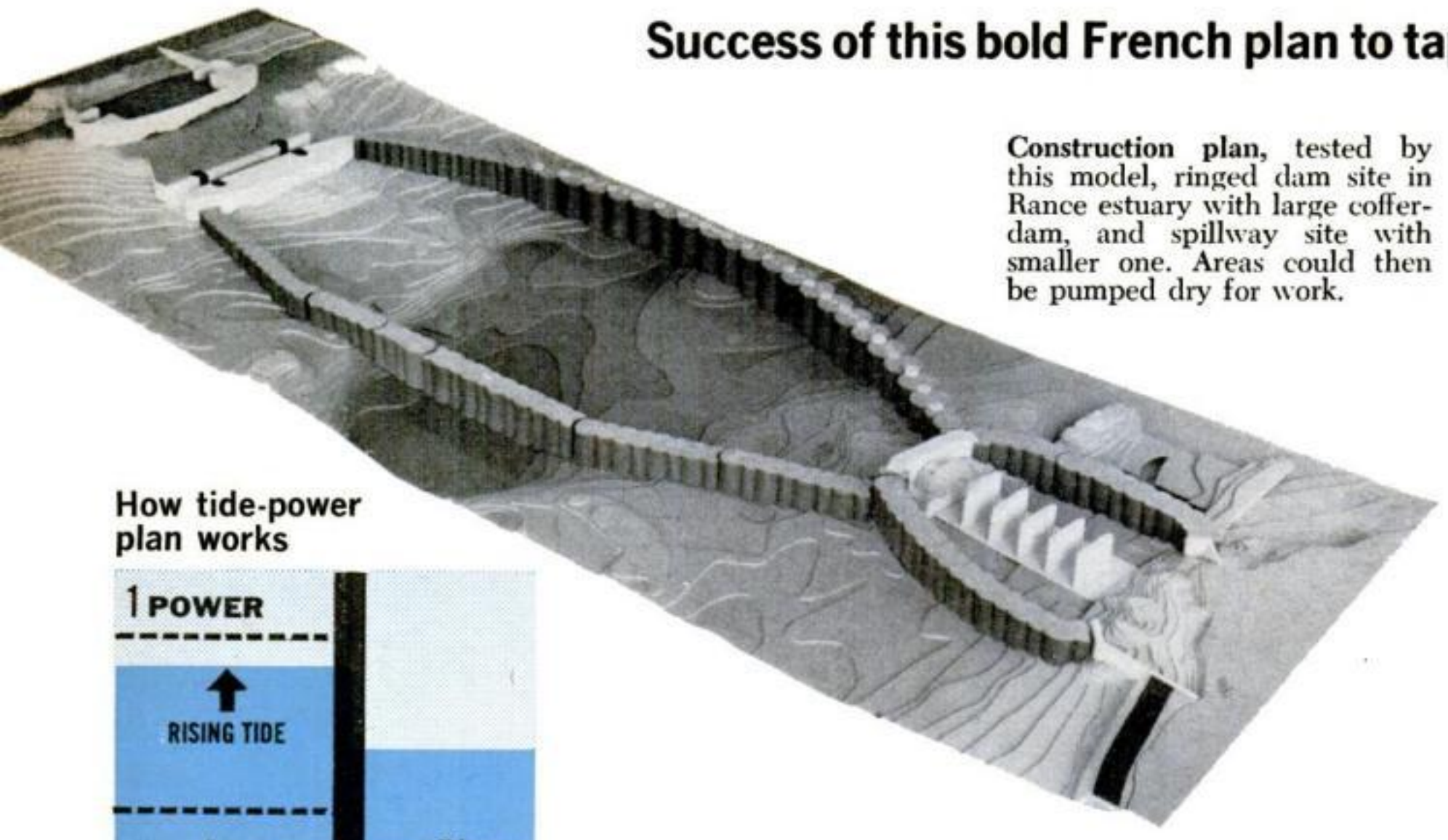
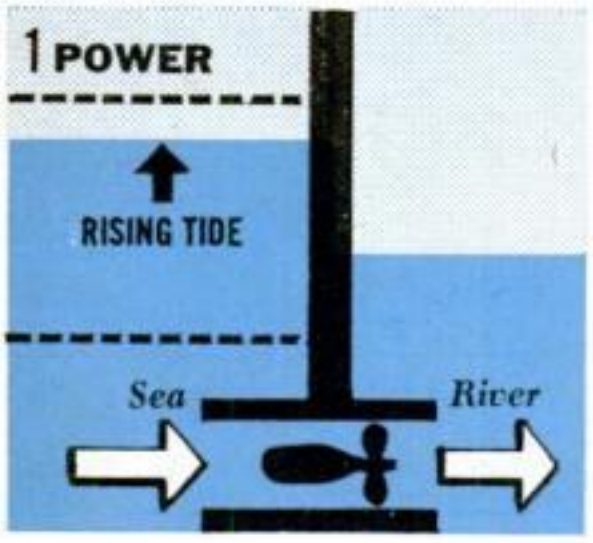
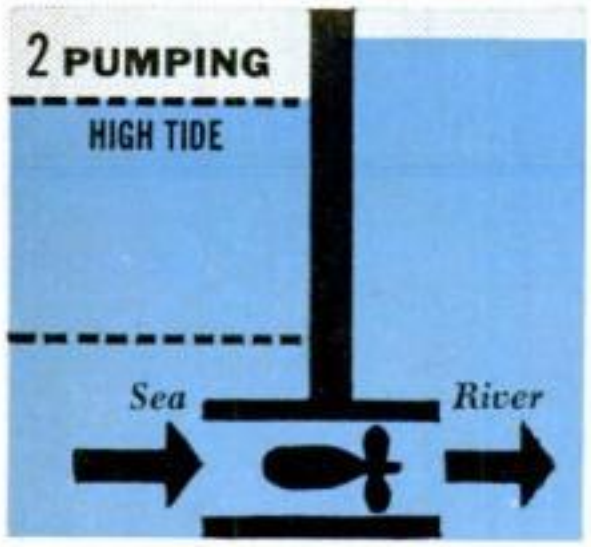
Success of this bold French plan to tap

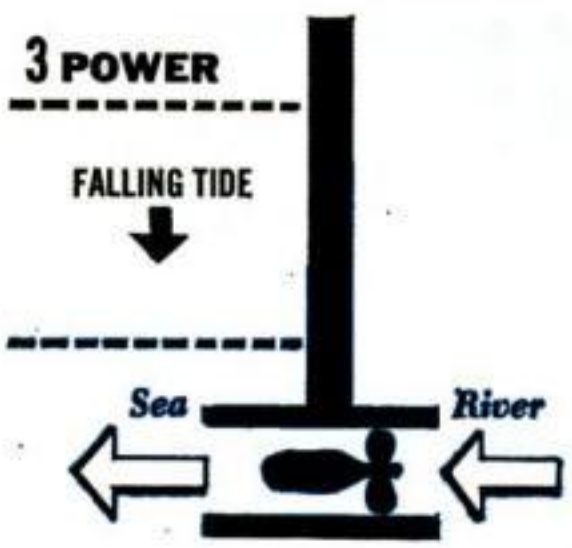


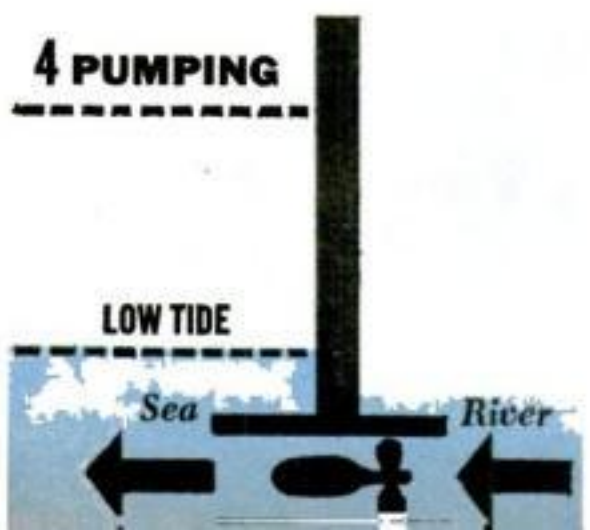
Construction plan, tested by this model, ringed dam site in Rance estuary with large cofferdam, and spillway site with smaller one. Areas could then be pumped dry for work.

How tide-power plan works









Eyes of engineers the world over will be on this plant as it goes into service next year. Its success could breathe new life into tidal projects proposed elsewhere—America's much-debated Passamaquoddy Bay scheme, others abroad.

From outside the completed French plant, you'll see simply a long low concrete barrier, spanning the nearly half-mile width of the Rance channel and rising only five feet above highest water. Its central section, a 1,300-foot-long main dam, is hollow. Hidden within the dam is the powerhouse.

A tunnel from shore gives access to the power station, where an arched gallery leads to control rooms, transformers, cables. But the most exciting machinery is in water tunnels beneath the floor—24 hydraulic "bulb" turbines, whose like has never seen practical application before.

A watertight bulb 50 feet long and 16 feet in diameter holds each turbine and—coupled to it by a massive shaft that's nearly three feet thick—a 10,000-kw. generator. Radial vanes suspend the bulb in the water. As if boarding a submarine, men can

Reversible turbines of new French plant can generate power both when tide is coming in and when it's going out. In between, they can double as pumps to fill river basin higher and empty it lower than unaided tide would do, thus increasing hydraulic head for next generating run. Diagrams, top to bottom, show principal stages of an operating program suited to medium tides. Other programs, adapted to lower or higher tides, range from simpler to more-complicated sequences. With proper timing, effect will be to convert Nature's offbeat 24 5/6-hour tidal rhythm into an artificial 24-hour one that conforms to daily power needs.

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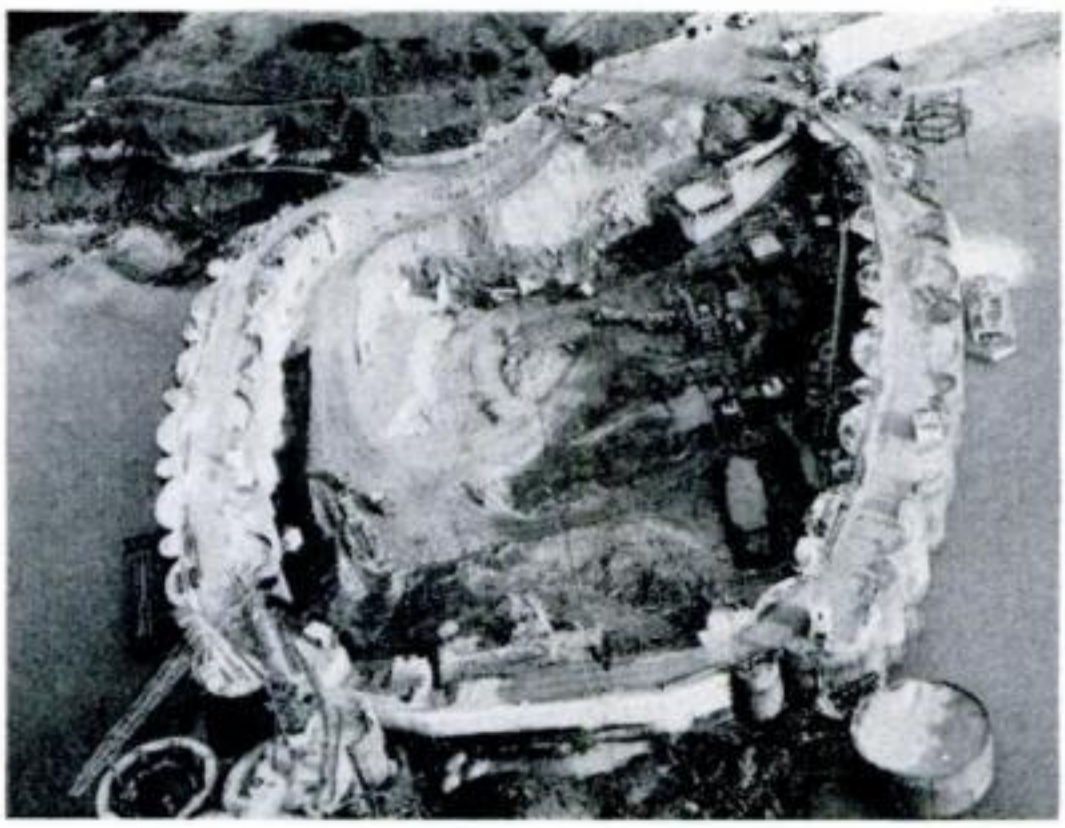
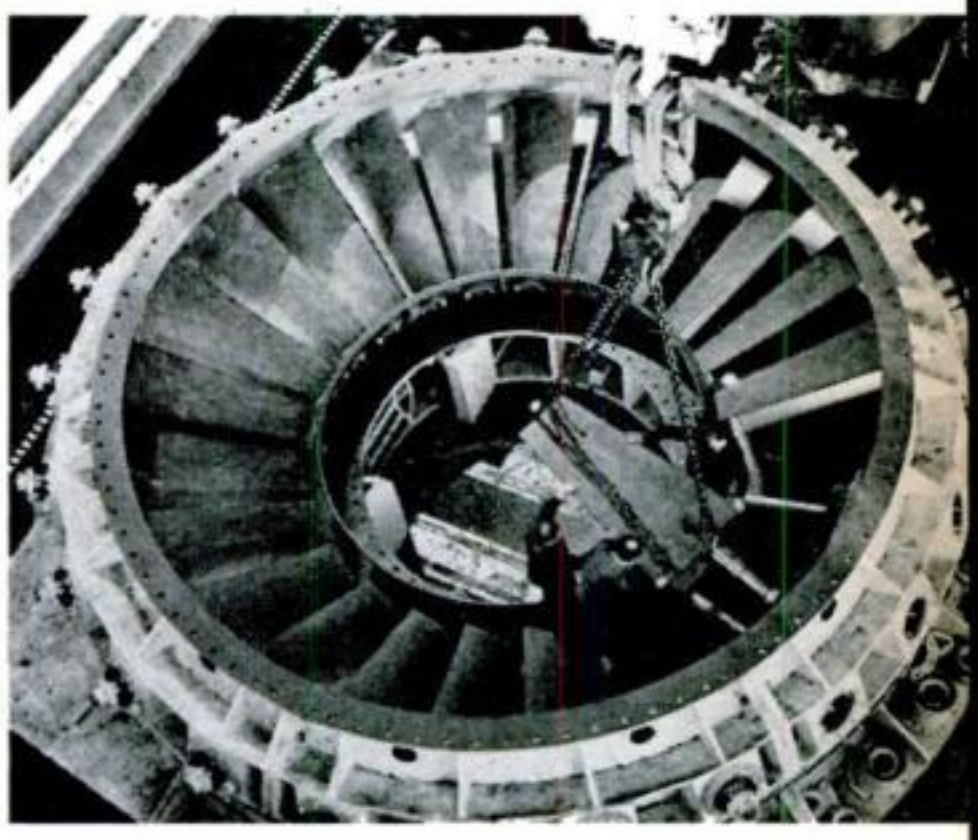
the ocean's energy could spur tidal projects here and abroad



Within cofferdam, sluiceway site has been freed of water by pumps. Next step, shown here, is excavation to bedrock to provide firm foundation for the huge concrete superstructure.



Ring of guide vanes is readied for installation in one of water tunnels. Movable vanes, which flank the turbine's propeller on the river-basin side, will help to regulate the flow of the water.

descend a tube-enclosed ladder and enter the submerged bulb for inspection or repair.

A 17½-foot propeller, which turns this "low-head" turbine at a ponderous 94 r.p.m., protrudes from the bulb. Its four variable-pitch blades may be reversed, providing an outstanding innovation:

Whichever way water flows—inward as the tide rises, outward as the tide falls—it will spin the turbine, and always in the same direction.

There is another key feature. If electricity is fed to the bulb, instead of drawn from it, the generator becomes a motor—and the turbine, a pump.

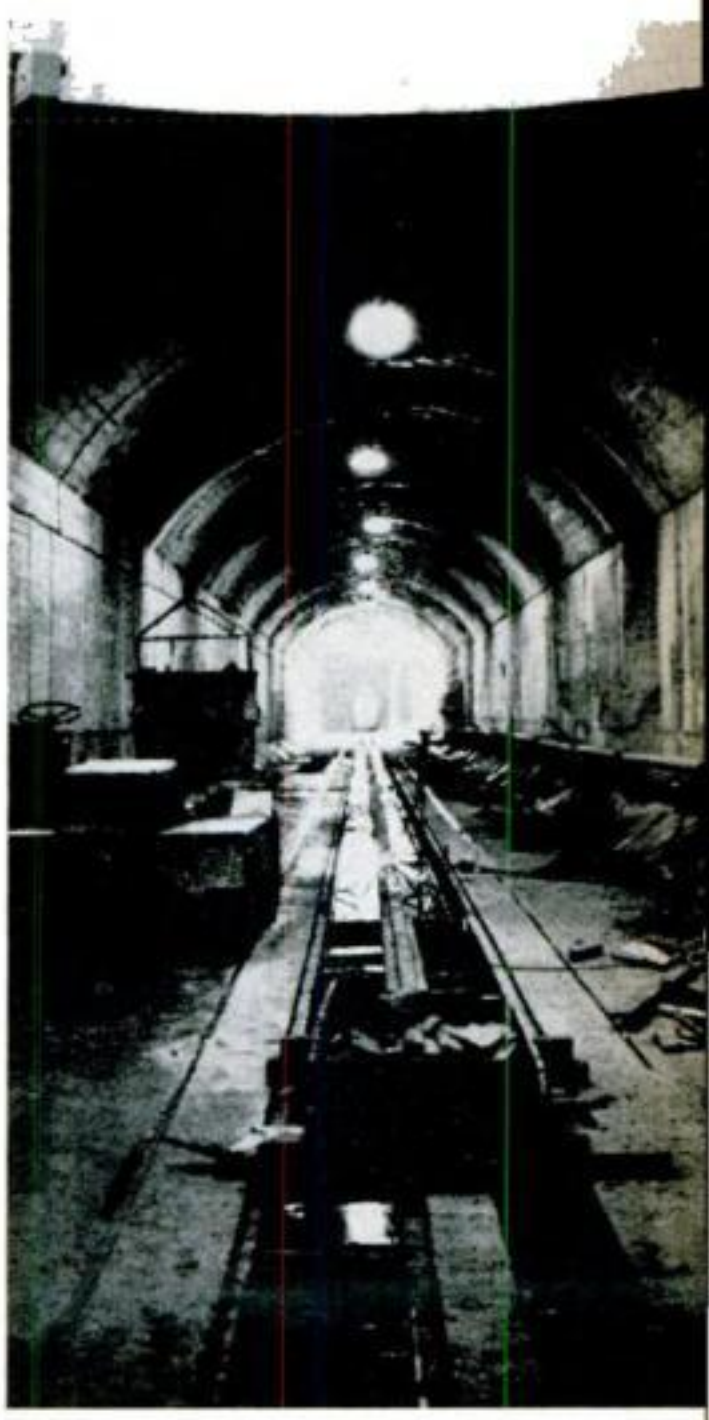
These advances are called the long-sought solution to the problems of tidal power.

The problems. The idea of putting the tides to work goes back centuries. Early, small-scale attempts used paddle wheels turned by rising or falling water, or floats geared to machinery. Equipment was costly, output meager. There were other serious drawbacks:

Tidal power lasts only a few hours at a time. The tides' size varies greatly with the moon's phases—and so would a tidal plant's maximum power. Worse, tides are linked to the lunar rhythm of 12 hours and 25 minutes. In most places, therefore, there are two high tides in 25-odd hours—a period out of step with our 24-hour day. Tidal power would come at different times each day—and, without means of storing it, would be of limited value.

The new Rance plant licks all these problems by creating artificial tides, of 24-hour rhythm, derived

[*Continued on page 182*]



Access tunnel from shore, passing under shipping lock, opens into gallery of the tidal powerhouse hidden within the dam. Water tunnels and turbines are situated on lower level.

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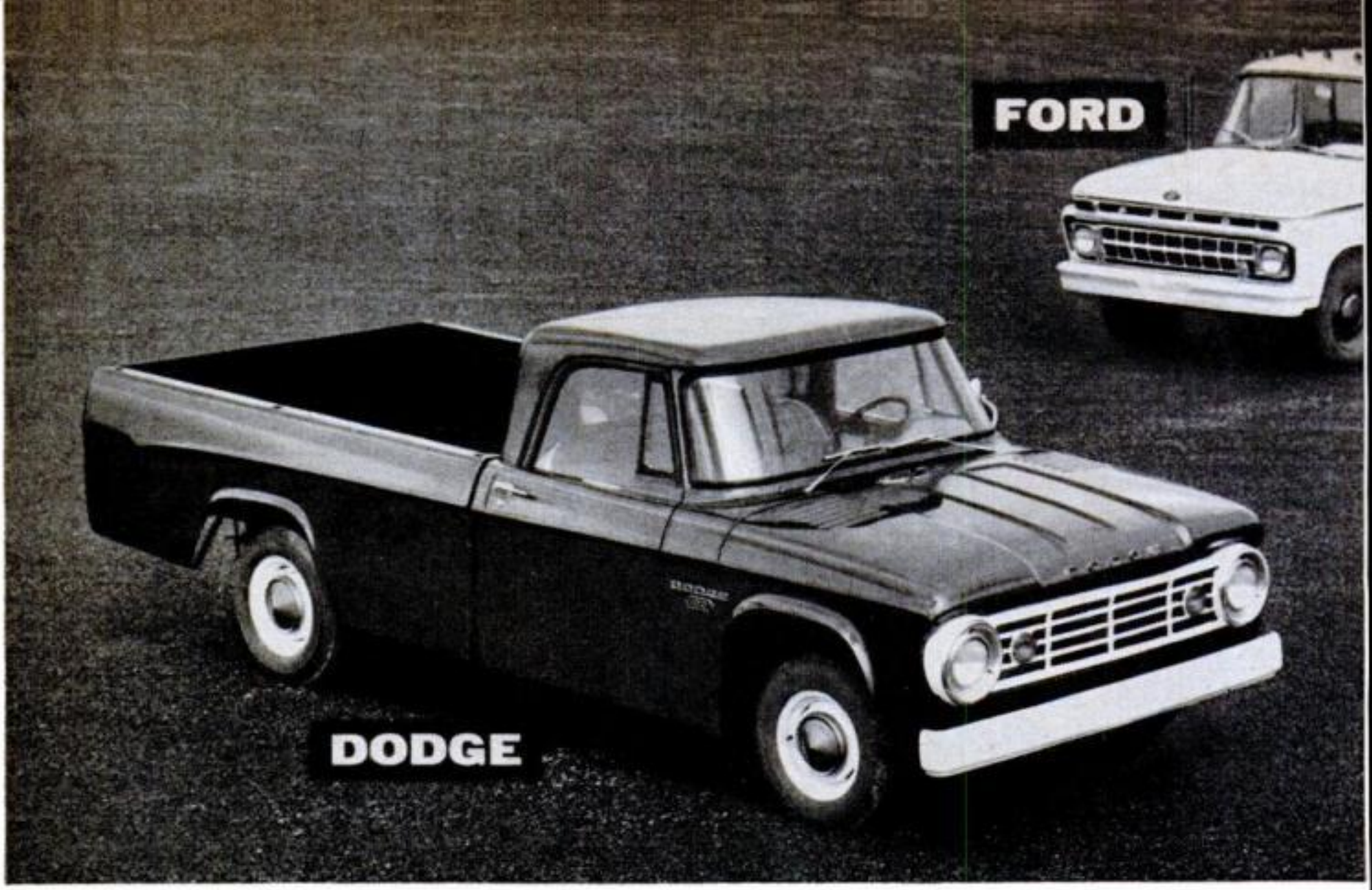

REPORT FROM THE DRIVER'S SEAT

Suddenly Pickup

Sales of pickup trucks are climbing at a faster rate than the record-pace 1965 passenger-car sales, as more and more one-car families find that a pickup truck fills all their needs.
PS reports on three favorite models

By Jan P. Norbye

FORD F-250 ride was relatively rough, but the pick-up's new Twin-I-Beam independent front suspension kept the steering free of wheel kick and vibration.

DODGE D-100 has better ride and handling than its suspension system gives it a right to. It is well balanced, has good pitch control.

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HALF-TON PICKUPS offer acceptable basic transportation for three persons at moderate cost. The Chevrolet comes closest to offering a passenger-car ride; the low-slung Dodge has the most comfortable seating.

Trucks Are IN

PICKUP truck sales have doubled since 1957. Truck production gained 48 percent in the past three years, and the climb continues. What's the secret behind this boom? The chief reason is the unlimited usefulness of the pickup truck. It seems to spend all its time on the go. Once you have a truck, you find more and more uses for it.

Pickup trucks are as popular as ever in local delivery service, in the oil fields and on the farm, but it's the city and suburban user who has made the boom. While pickups are used, increasingly, for camping vacations and hunting trips, another trend, more subtle, has now spread across the nation.

Many people have rejected the conventional American passenger car. In their search for a satisfactory automobile they have been through the whole gamut of utility vehicles, from Volkswagens to station wagons. Today they are turning to pickup trucks. Far from feeling that the trucks disgrace their driveways, they see them as proof of the owners' astute business sense.

With the 1965 pickups, Ford has experienced a sharp rise in the demand for

CHEVROLET C-10 gave best ride, unladen, on smooth and rough surfaces alike. But the short wheelbase makes pitching movements inevitable.

CONTINUED

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V-8 engines, four-speed floor shifts, and bucket seats. Also, sales gains center on the F-250 rather than the cheaper F-100.

Chevrolet's C-10 is the No. 1 pickup, outselling all challengers year after year. It comes closer to passenger-car standards of ride comfort than the others. Chevrolet has also had a large increase in automatic-transmission installations. Newcomers to pickups from passenger-car ownership seem to want the same equipment.

Dodge's D-100, a light truck scaled down to pickup size, could never be mistaken for a passenger car. It is made in considerably smaller numbers than its Ford and Chevrolet rivals, but it outsells the heavy-duty favorites: GMC and International Harvester.

After a week with a Chevrolet C-10, a Dodge D-100, and a Ford F-250, I am enthusiastic about the pickup truck as personal transportation. They are wonderfully practical vehicles, and they are easy to drive. The controls are the same as in a passenger car, but in the pickup, the driver sits higher up and can see more. The trucks are maneuverable and easy to park. All these factors work together to give the novice driver a greater sense of safety than is possible in many passenger cars, with their low seats and long hoods and deck lids. Perhaps a million people in this country learned to drive on pickup trucks.

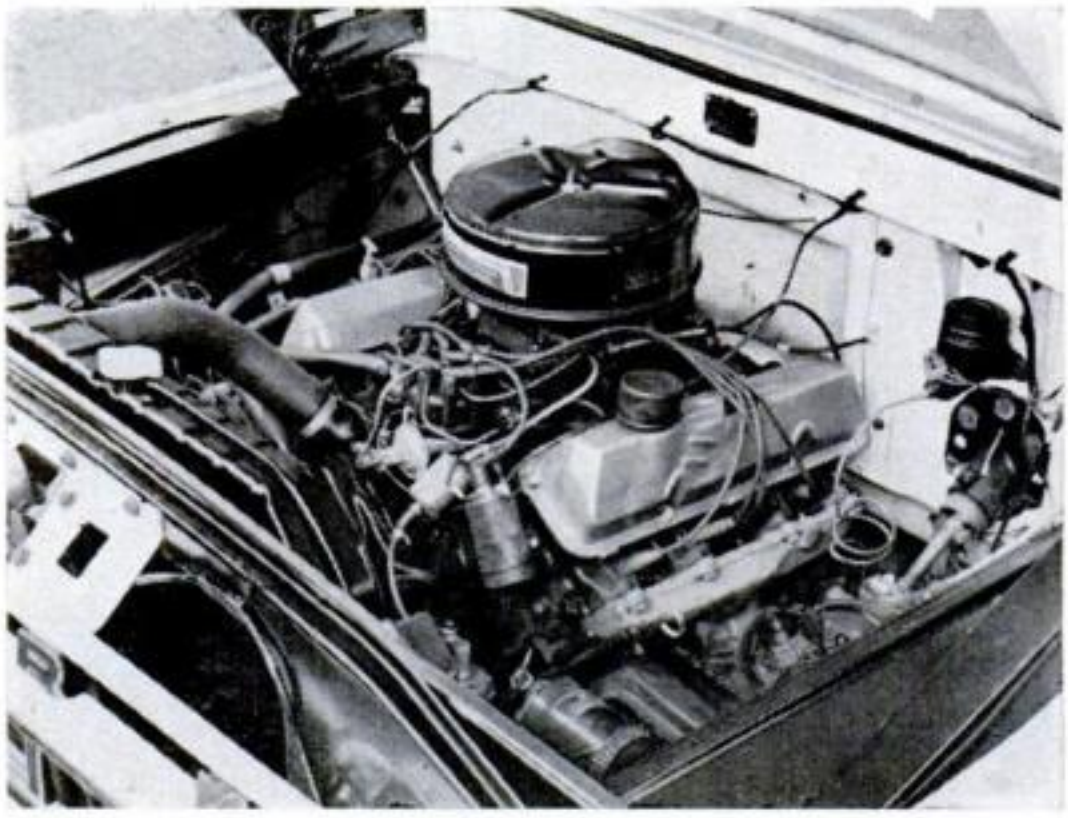
Driving problems. Pickup trucks, of course, aren't really as safe as they feel. They have high centers of gravity and—unladen—a severe forward weight bias. This makes the unloaded pickup trickier to drive in rain or snow than the passenger car. The rear brakes tend to lock up and cause rear wheel skids, which may lead to loss of control.

In many ways, a pickup is like a powerful sports car. There is no rear seat, and high power combined with a light rear end gives the same sporty impression. In restarting from standstill on a dirt road, you will usually get some wheel spin.

But today's suburban housewife would have no more trouble driving a pickup truck than she has with her old station wagon. If she wants power steering, she can get it. If she can't shift gears, she can get automatic transmission. If she's afraid of wheel spin, she can get a limited-slip differential.

By passenger-car standards, pickups

FORD cab offers the best compromise in choice of interior dimensions and layout. Tall people might prefer its seating to the Dodge's.



FORD 352-cu.-in. V-8 is an old heavyweight with poo. economy but lots of power. As in all V-8s, accessibility is poorer than in sixes.

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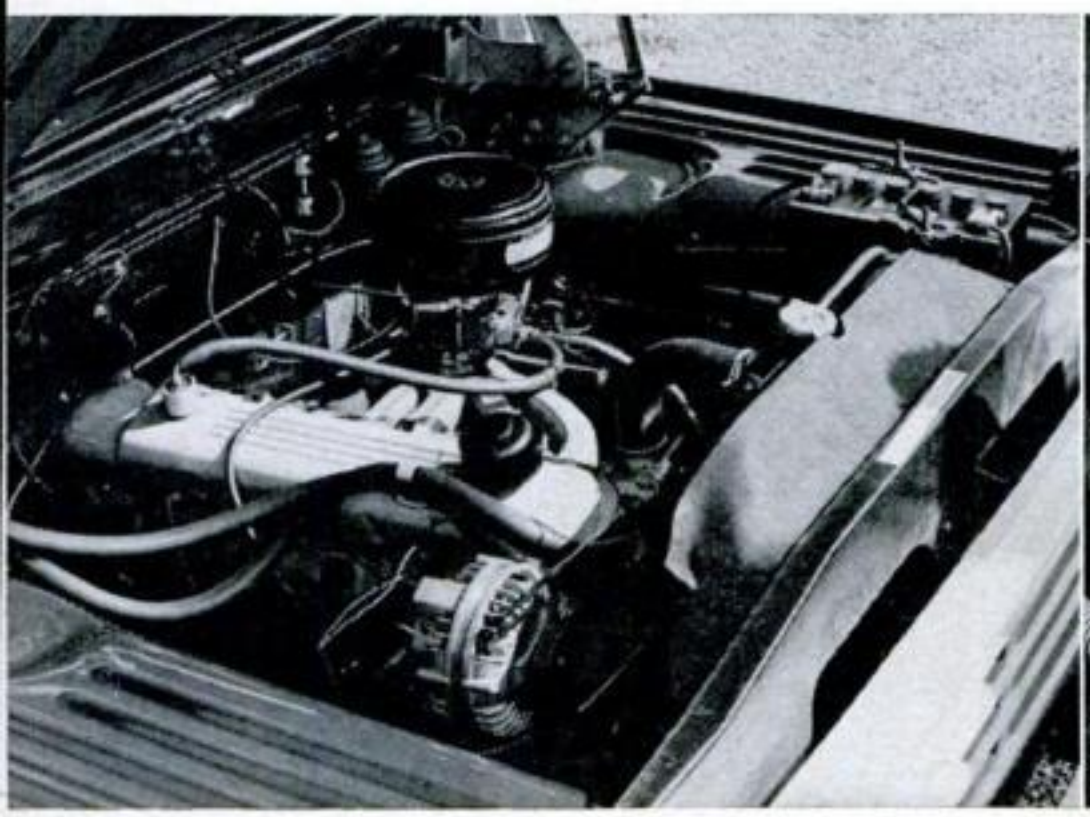
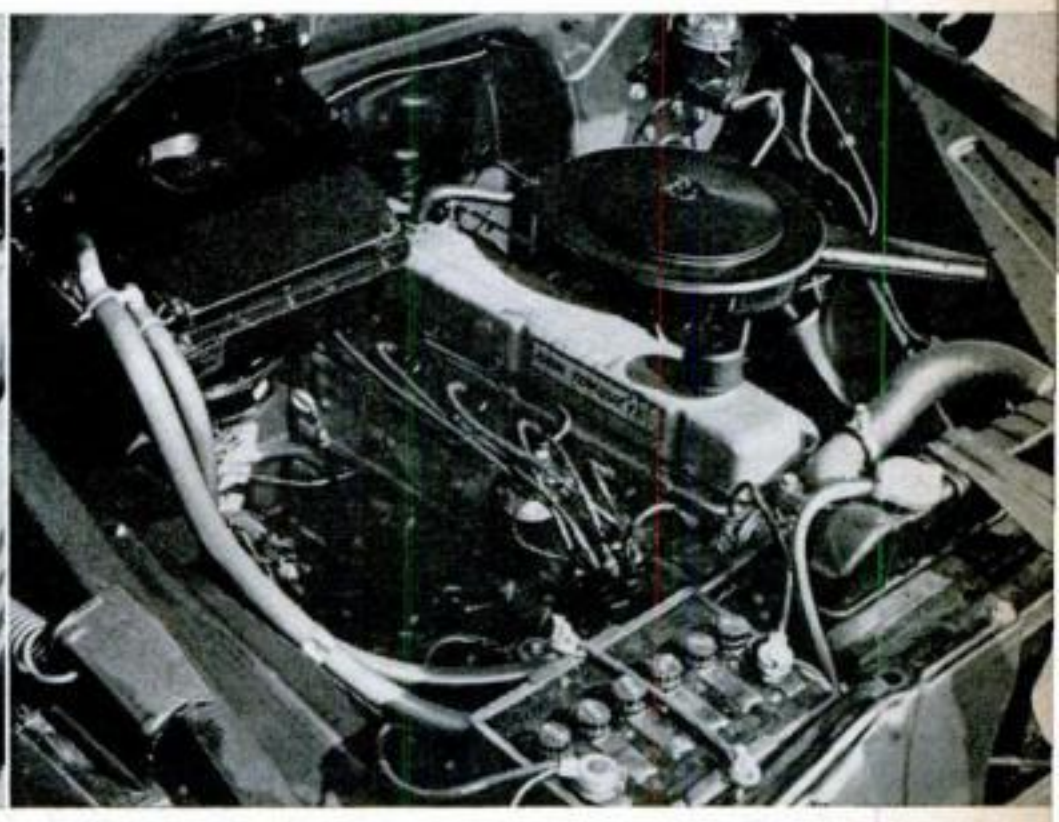
DODGE offers the most comfortable driving position despite lowest seat. Drop-section frame makes it the easiest for getting in and out.

CHEVROLET offers the most comprehensive set of instruments, but lacks space for the driver's arms. Steering-wheel rake is most convenient.



DODGE slant-six 225-cu.-in. engine is extremely quiet although it has only four main bearings. Accessibility is good, gas mileage average.



CHEVROLET 230-cu.-in. six has a seven-main-bearing crankshaft and runs very smoothly. Accessibility is excellent, gas mileage good.

don't offer an acceptable ride. Older people often get sick on a trip. Fit soft springs, and you cannot carry much cargo. Beef up the springs, and the ride gets too hard. Besides, the short wheelbase makes pitching movements inevitable even on good roads.

Although pickup-truck prices have gone up over the years, you still get a lot of basic transportation for your money. Prices start below $2,000, and many people find better value in a truck than in a passenger car at that price. The pickup is not only a great choice

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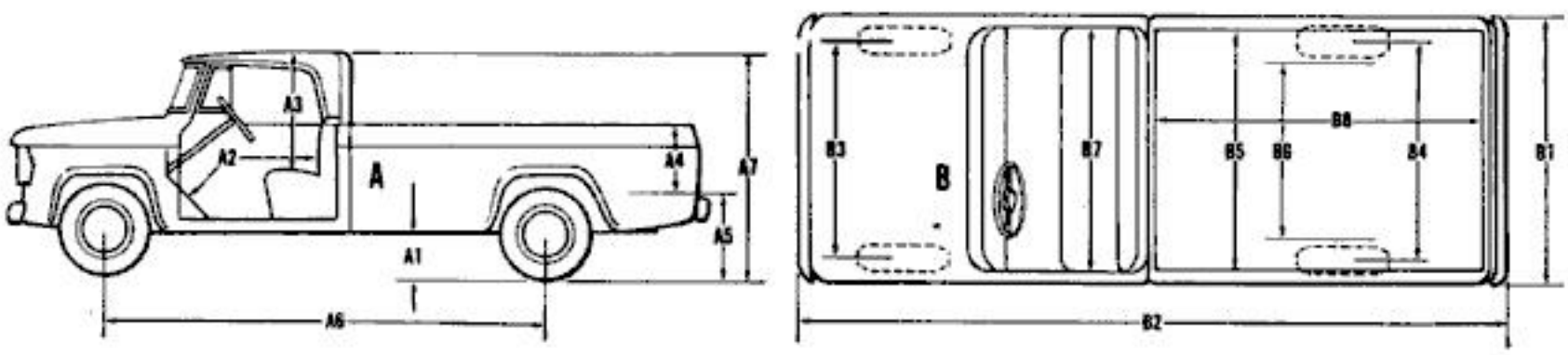
Urheberrechtlich geschütztes Material

for a second car—it's often a wise choice for an *only* car.

On the other hand, it's not difficult, if you go for the extras, to bring the showroom price tag on a well-equipped pickup truck to over $3,000.

At home on the range. Today's market is option-happy, and all kinds of passenger-car features and gadgets are finding their way into pickups. Customizing is common in the Southwest, where wealthy ranchers now use pickups as they once used horses. They usually remove the spare wheel from its standard location under the rear end of the bed and fit a heavy iron bar in its place to put more weight on the driving wheels. The spare goes on a new mount on the side. Add searchlights, air horns, and rifle mounts, and you're a full-fledged "windshield farmer."

You can also tailor the power on your pickup to your exact requirements. Ford's standard engine is a 240-cu.-in. six; a 300-cu.-in. six and a 352-cu.-in. V-8 are optional. Power output ranges from 150 to 208 hp. Chevrolet gives you a choice of four engines: a 230 six, a 292 six, a 283 V-8, and a 327 V-8, with an output range of from 140 to 220 hp. Dodge's standard engine is a 225-cu.-in., 140-hp. slant-six. The 170-cu.-in., 101-hp. slant-six is an economy option, and the power option is a 318-cu.-in., 200-hp.



	CHEVROLET C-10	DODGE D-100	FORD F-250
DIMENSIONS (inches)			
A1 Ground clearance	6.5	7.0	10.5
A2 Legroom	43.0	44.0	43.5
A3 Headroom	36.5	38.5	39.0
A4 Bed depth	19.5	20.0	19.5
A5 Loading height	23.5	22.0	26.0
A6 Wheelbase	127.0	128.0	129.0
A7 Overall height	73.0	68.0	76.0
B1 Overall width	77.5	77.5	77.5
B2 Overall length	204.0	207.5	202.5
B3 Front track	63.0	64.0	63.5
B4 Rear track	61.0	62.5	62.0
B5 Bed width (max.)	72.0	70.0	70.0
B6 Bed width (min.)	50.0	49.0	49.0
B7 Seat width	59.0	59.0	22 (2)
B8 Bed length	95.5	98.5	98.5
SPECIFICATIONS			
Engine type	OHV Six	OHV Six	OHV V-8
Bore & stroke	3.87 x 3.25	3.40 x 4.125	4.00 x 3.50
Displacement	230 cu. in.	224.6 cu. in.	352 cu. in.
Compression ratio	8.5:1	8.4:1	8.9:1
Carburetion	Single 1-bbl.	Single 1-bbl.	Single 1-bbl.
Fuel grade	Regular	Regular	Regular
Horsepower	140 @ 4,400	140 @ 3,900	208 @ 4,400
Torque	220 @ 1,600	215 @ 1,600	315 @ 2,400
Transmission	3-speed manual, column shift	3-speed manual, column shift	4-speed manual, floor shift
Axle ratio	3.73:1	3.55:1	3.50:1
Tire size	7.75 x 15	6.70 x 15	7.00 x 16
Steering ratio	33.1:1	26.7:1	24.1:1
Turns (lock to lock)	5.500	5.125	4.750
Turning circle	46.4 ft.	43.8 ft.	46.8 ft.
Brake-swept area	276 sq. in.	292.5 sq. in.	304 sq. in.
Curb weight	3,455 lb.	3,585 lb.	3,655 lb.
Price as tested	$2,060	$1,881	$2,751

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V-8. In addition, there's an incredible Dodge Custom sports special available with the 365-hp., 426-cu.-in. V-8. Ford, Chevy, and Dodge meet head-on, model for model, throughout the standard production range. With normal gearing, the six-cylinder models seem to settle for a 65-m.p.h. cruising speed, while the V-8s will run all day at 85 m.p.h., with any permissible load, or even hauling a trailer.

Chassis and suspension design provide more variety than the power teams. Chevrolet uses an all-coil suspension system based on passenger-car engineering. Ford has a new front end called Twin-I-Beam with coil springs, but uses conventional leaf springs at the back. The Dodge has semi-elliptic leaf springs all around, just like the big trucks.

The Twin-I-Beam design offers independent front suspension at far lower cost than is possible with modern passenger-car systems. Each wheel has its own axle beam. Instead of being connected to each other, they are pivoted in brackets on the frame's opposite side member. Fore and aft location is assured by forged-steel radius rods.

Chevy front end good, too. There is no practical difference in behavior between the Twin-I-Beam and short-and-long transverse-arm systems on light trucks. Wheel location is positive in both cases, and the steering is free of wheel kick and vibration. Ford claims simplified maintenance and extreme ruggedness for their Twin-I-Beam design, but the Chevrolet front end has proved its durability on medium-duty trucks for years and has no apparent drawback.

The overall superiority of independent front suspension over beam axles was proved about 30 years ago and has been proved over and over again since then. But in all fairness to Dodge, I must point out that under normal driving conditions, the disadvantages of the front axle do not make themselves felt in the D-100.

Personally, I found that the Dodge had the most comfortable driving position. This came as something of a surprise, for the truck-like 45-degree rake of the steering wheel looks anything but comfortable. I prefer the Dodge seating because I can get farther away from the wheel in the D-100 (16 inches) than in the C-10 (14 inches) and the F-250 (15.5 inches).

Curiously, the pickup trucks have better instrumentation than the passenger cars that share the same power teams. For instance, all the trucks have temperature gauges. But only the Chevrolet has an oil-pressure gauge.

Trying the trio out. I put about 250 miles on each truck. The Chevrolet remained trouble-free throughout the test period. The Dodge developed a rattle in the tailgate, and the action of the hydraulic-clutch mechanism was erratic. On the Ford, the wipers failed and the dome-light switch was inoperative. Such nuisance troubles, of course, are easily fixed by the dealer while the warranty is still in effect. And, of course, these failures are not necessarily indicative of the trucks' overall quality.

The Chevrolet is an obvious choice if you're usually running light. It has the best empty-bed ride, has the widest bed (but the shortest), and uses a wood floor for better protection against rust and noise.

The market for four-wheel-drive pickups is bigger than Kaiser Jeep facilities will ever be, so Ford, Dodge, and Chevrolet do a big business with four-wheel-drive versions of their standard pickups. These are greatly favored by campers. Recent rumors have it that Ford is planning a six-passenger pickup truck for camping.

Most privately owned pickups are engaged in very irregular service, frequently occasional. For this kind of use, people choose the low-cost models of Chevrolet, Ford, and Dodge. But as soon as you get into heavy-duty, full-time operation, and fleet use, people will tell you about GMC and International. The IHC doesn't have much performance, but fleet operators, interested in dollars and cents, just love it because it lasts forever and ever.

The GMC has much in common with the Chevy line, in cab structure and dimensions. But even the light-duty GMC is a heavy-duty truck, with frames, brakes, and springs designed for higher loads. The GMC rear axle, for instance, is anchored with both leaf springs *and* radius rods. In addition, GMC has made a specialty of diesel-engined pickup trucks.

For really light service, you may feel that even the C-10, D-100, and F-100 are too truck-like. Then you would do well to look into such stylish pickups as the Chevelle-based El Camino and the Falcon-based Ranchero. And if you are buying a pickup because all you really want anyway is a two-seater, Chevrolet offers another car that might take your fancy. It's called the Corvette. ■ ■

Urheberrecht ch geschützt Mixed al

Our top anti-narcotics agent tells the inside story of how three nations combined to fight

The Dope-

Etienne Tarditti passes through Customs in New York, unaware agents have photographed him

The diplomats and their supporting cast

Robert Leon Le Coat, Paris gangster, helped set up smuggling operation.

Gilbert Coscia eluded net; helped reopen diplomatic pipeline for drugs.

Jean Baptiste Giacobetti, narcotics trafficker, teamed up with Coscia.

Rene Bruchon disagreed on price with U.S. contacts—blew whole deal.

Felix Alfred Barnier drew five-year sentence from the French court.

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Smuggling Diplomats

By Henry L. Giordano
as told to
James C. G. Conniff

FOR years, we in the Federal Bureau of Narcotics have known that the international criminals who control the traffic in narcotic drugs regularly utilize high-ranking diplomats as couriers. If we could stop the diplomatic couriers, we could cut the flow of dope into this country to a trickle. Putting this criminal hierarchy out of business is a difficult assignment, however, because of their diplomatic status. One huge ring employing such couriers brought in the biggest consignment of heroin ever to enter the U.S.—one ton.

Cracking this case was one of the most difficult assignments in the 35-year history of the Bureau; its climax was one of the most satisfying.

We began moving in on the ring when our agent in Beirut learned that a huge shipment of morphine was en route from Lebanon to France. There, a supposedly reputable businessman, Etienne Tarditti, would receive the morphine, converted to heroin. Through his connection with French gangsters Felix Barnier, Gilbert Coscia, and Robert Le Coat, he would have it smuggled into the United States.

Henry L. Giordano, Commissioner of the U.S. Bureau of Narcotics since 1962, joined the Bureau as an agent in 1941. During World War II he served in the Coast Guard Intelligence.

Putting together the bits and pieces

How did the gang do the smuggling? We learned that: 1) Charles Bourbonnais, an airline purser on a Paris-New York run, was smuggling heroin into the U.S. for Tarditti and his friends and, for a one-percent commission, would bring back the payoff money. 2) More important, Tarditti had flown across the Atlantic with an unidentified Spanish-speaking diplomat who got VIP treatment from airline personnel.

We also learned that Bourbonnais used prearranged signals here when negotiating the turnover of drugs. He matched half-stubs of French lottery tickets with receivers

CONTINUED

Mauricio Claudio Rosal—Ambassador—was kissed off by his government.

Nicholas Calamaris was New York drop for shipment Rosal brought in.

Juan Carlo Arizti had company while smuggling—agents sat beside him.

Charles Bourbonnais delivered more than $1,000,000 to Paris dope ring.

Salvador Pardo-Bolland was decoy, but he didn't fool tailing federal men.

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Driving with one hand, he jotted down

—first with a New Yorker named Robert Ager, and later with Joe Cahill (still a fugitive at this writing and the only member of the ring not yet brought to justice). Bourbonnais had successfully run his vicious contraband at least 50 times, earning over a million dollars for the Paris-based quartet.

Our next step, you might think, would be to arrest the whole gang without delay. But we wanted to nail every member of the ring; we didn't want the big ones to get away.

Flushing out a diplomat

If we could track down the mysterious Spanish-speaking diplomat, we would be in a position to determine whether he, too, was a runner. That would give us the chance to turn our tip from Beirut into a grand slam. We'd round up, not just the Paris ring, but its diplomatic front and New York contacts.

An exhaustive checkout by the French Sûreté and our agents in New York identified the courier the Tarditti ring had persuaded to misuse his diplomatic immunity. He was the Guatemalan Ambassador to Belgium, Mauricio Rosal.

What made us sure that Rosal was our man? Airline manifests showed his baggage was always 100 pounds heavier when he entered the U.S. than when he returned to Belgium. We knew those extra 100 pounds couldn't be diamonds —a flood of diamonds like that would have them selling for a dime apiece. They couldn't be gold—illicit traffic in gold is in the other direction; gold smugglers keep trying to get the stuff *out* of the country. Rosal's extra baggage could contain only drugs.

Late in September, 1960, we received a cable alerting us that Tarditti had left Paris with three suitcases to meet Rosal in Brussels. Tarditti then returned to Paris and booked a single air passage to New York for October 1. At the same time, the watch we had put on Rosal reported he was scheduled to fly from Brussels to New York on October 2. We were pretty sure he'd have Tarditti's three suitcases with him.

We made plans to tail this pair from the moment they landed. When Tarditti ducked into a taxi at Idlewild (now Kennedy) Airport, the driver was one of our agents.

"Sherry-Netherland Hotel!" snapped Tarditti.

"Sherry-Netherland it is, sir!" our agent repeated in a loud voice, so that other agents nearby would hear.

But Tarditti was slick. After the cab pulled away he leaned forward and said softly, "Make it the Savoy Hilton instead."

Our man at the wheel wasn't outsmarted. Driving with one hand, he jotted the change on a paper and dropped it out the window. Agents tailing the cab picked up the vital slip.

We had to plan a whole new reception. To provide extra time, Tarditti's "cab driver" complained he had to drive slowly because of engine trouble. Tarditti just snorted impatiently. By no coincidence, his room was just across from one occupied by our agents.

A touchy situation

Mauricio Rosal turned out to be trickier than we'd anticipated. He came in on a Pan-American flight, cleared quickly through Customs at the diplomat scales, but told a porter trying to steer him to our cab that a private car would pick him up. Our agents marked his bags with a knife for future identification while he wandered around the terminal.

A rented station wagon picked him up. The driver went so fast through heavy traffic to Manhattan that two of our cars had accidents trying to keep up. But we didn't lose him. Our men were at Rosal's side when he registered at the Plaza, directly across from the Savoy Hilton where Tarditti was.

Rosal could hardly have picked a

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the address, dropped it out the window

more touchy time to smuggle in Tarditti's suitcases. A tumultuous session of the United Nations was under way. Khrushchev was pounding his shoe on his desk, while Fidel Castro and other Red leaders sat nearby. It was definitely not the time for a federal agency to arrest a diplomat unless it had an airtight case.

We had not yet actually had a chance to *see* what was in those three bags. Every agent who was in on the delicate operation, including District Supervisor George H. Gaffney (now U.S. Deputy Commissioner of Narcotics), had his fingers tightly crossed.

The next day, October 3, was D day. The delivery of Rosal's suitcases to the New York buyers was a maneuver so slippery—yet at the same time so clumsy—that we had to decide almost on the instant when to make our grab.

It went like this: Tarditti popped across the street to Rosal's room the evening he arrived, to make sure the suitcases had arrived, too. He made a second check next morning while Rosal was having breakfast.

The first payoff

Tarditti came back on a third visit, just before noon, with a small brown-paper bag—which he no longer carried when, a few minutes later, he left the Plaza for the last time.

Agents trailing Tarditti had seen him accept the paper bag at a meeting with the airline purser Bourbonnais on a park bench across from the Plaza, but it was not until later that we learned what it contained: $27,000 in cash, Rosal's payoff. Bourbonnais had received Rosal's fee earlier from Nicholas Calamaris, a hoodlum who had replaced Joe Cahill, who had in turn replaced Ager.

When Tarditti handed over the payoff money, he told Rosal to check out at 12:30 p.m. and take the suitcases in a taxi to 72nd Street and Lexington Avenue for a rendezvous with Calamaris. We were with him all the way. We saw Tarditti, Bourbonnais, and Calamaris have Rosal's driver open the taxi's trunk to prove the bags were there. Then Tarditti got in with Rosal and the cab turned east.

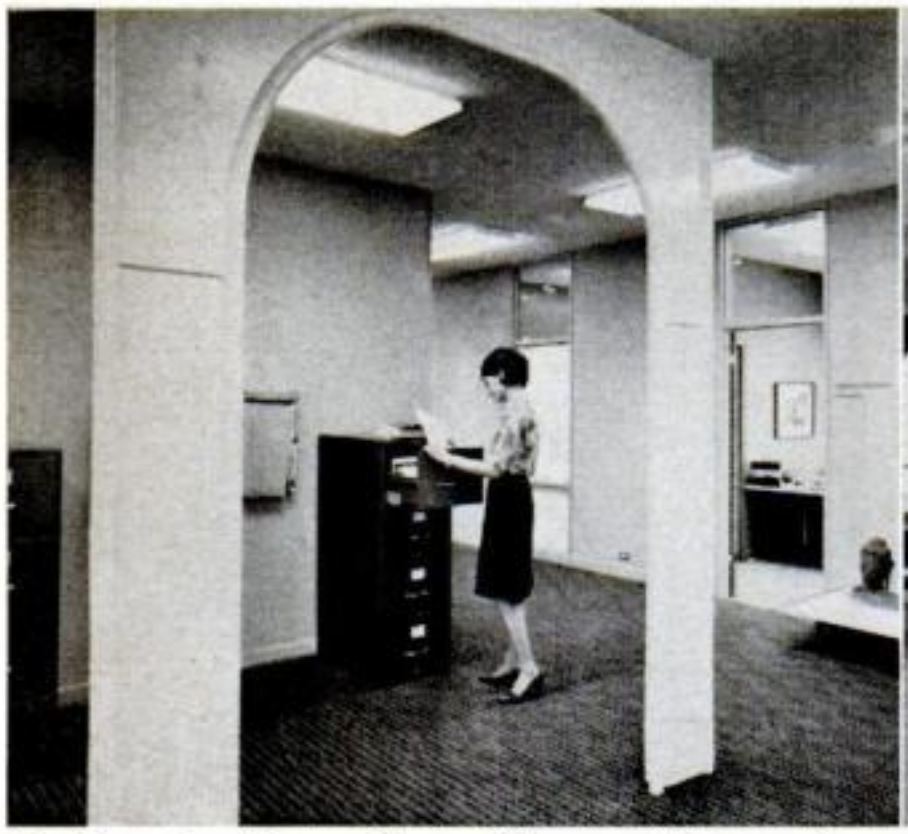
Bourbonnais and Calamaris headed north in the hoodlum's station wagon. We had no idea where they might be going to make the actual transfer, driving off in different directions like that, so it was now or never. And if we hadn't carefully coordinated our efforts with the State Department, it could have been never. But State had assured us that since Rosal was not en route to or from his post of duty, he had no diplomatic immunity. We could seize him without upsetting any international applecarts.

Second payoff—stiff sentences

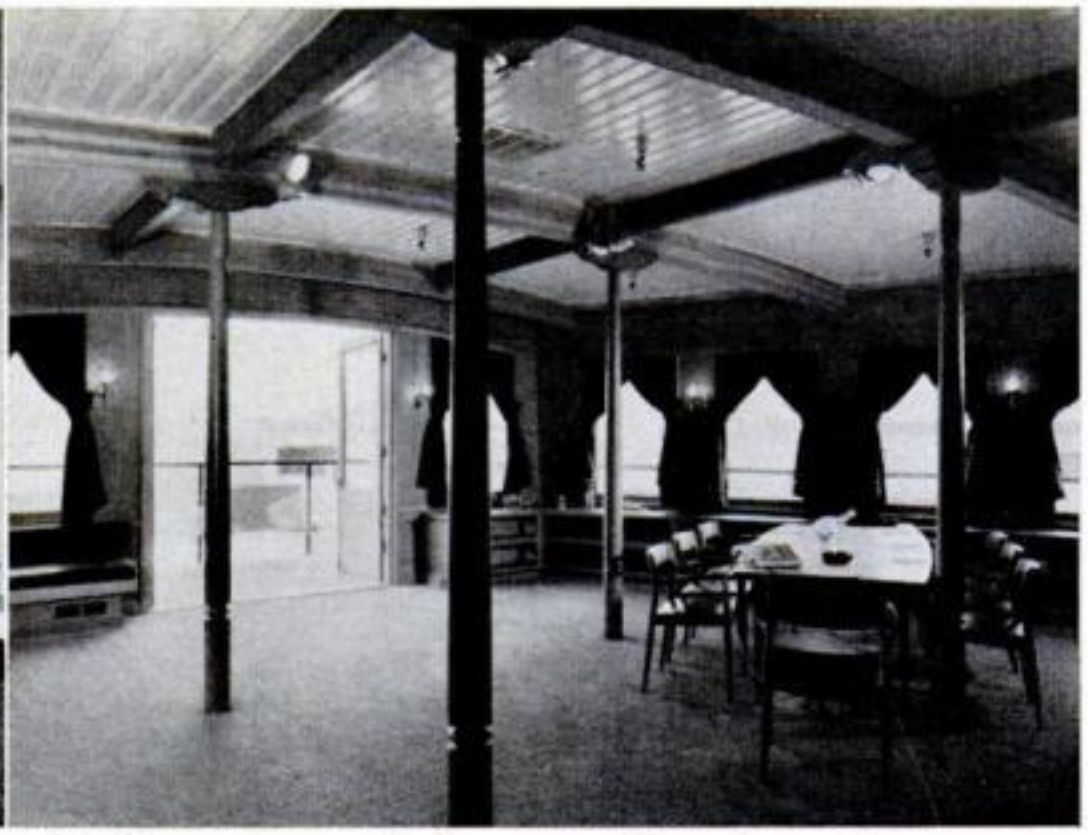
Despite expected protests of immunity, we arrested Rosal with the drugs and payoff money. He swore the bags in the trunk weren't his, but the knife marks were there. Then Tarditti and company were gathered in. Another $41,000 for Tarditti was in Calamaris' wagon.

[Continued on page 202]

High-living diplomat Mauricio Rosal sits beside part of the huge haul of heroin he smuggled into the U.S. He's now serving a 15-year sentence in federal prison.



Nothing in this modern office would hint that it's a boat—except rise and fall of the tide.



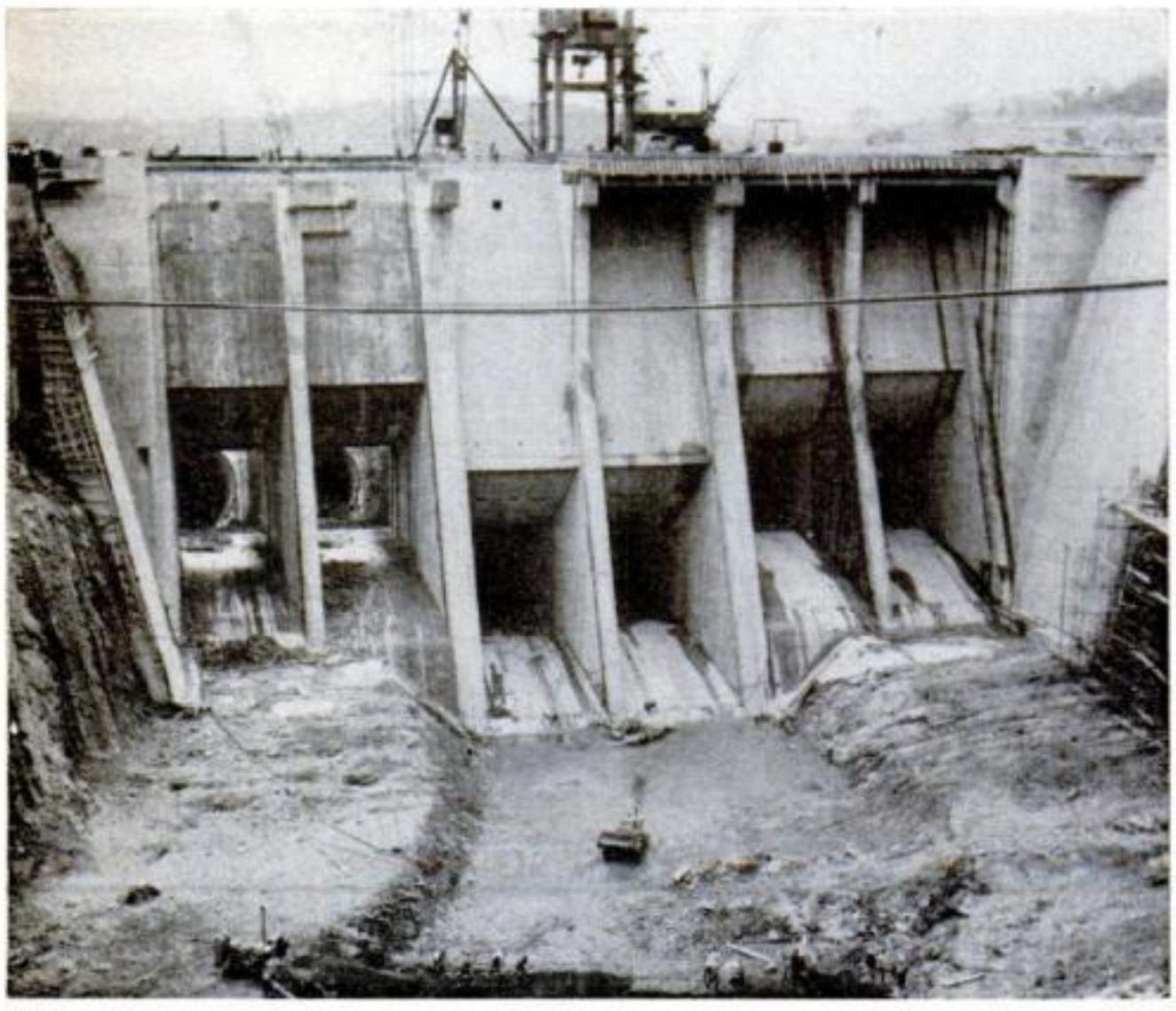
Conference room looks out on bay. It used to be ferry's main upper-deck passenger cabin.

New San Francisco business address: Pier 5 North

Cramped by lack of office space, a San Francisco firm has taken to the water. Walter Landor & Associates, industrial designers, bought one of the last San Francisco Bay ferries, the Klamath, outmoded by modern bridges, and converted her into a floating office and studio building.

Towed to a centrally located pier, the Klamath gave up her engines and propellers, was connected to water, electric, telephone, and sewer lines, and was remodeled from stem to stern. Electronic equipment was installed to keep the steel hull from rusting and eliminate the need for periodic drydocking for scraping and painting.

With air conditioning, acoustical ceilings, and wall-to-wall carpeting, few employees realize they are working in a boat—except for the rise and fall of the tide or the slap of waves when a tug rides past.



Boost in electricity for industrial Africa

The main dam of the Volta River project in Ghana is nearing completion at left. The first turbine will be installed this fall.

Dams of the giant hydroelectric project are backing up waters for what is planned to be the world's largest artificial lake. They will provide cheap and abundant electricity for industrialization of the country at a cost of $200 million.

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Permanently tied up at pier, floating office building has entrances by fore and aft gangplanks.

Station wagon is bus or camper

Built on a small-truck chassis, GMC's new Handi-Bus can seat up to eight adults or, with optional rear seats removed, haul a ton of cargo. It can also be converted to a camper that sleeps several persons. Standard and custom models are powered by 194-cu.-in., 120-hp. sixes, a super custom by a 230-cu.-in. six developing 140 hp.

Slot-machine post office

Completely automated, this post office uses no manpower except to fill its stamp and money bins and to pick up mail. In a Wheaton shopping center, Maryland suburb of Washington, it has vending machines for stamps and for changing coins and bills. A scale weighs parcels for customers and tells them how much postage is needed.

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Clipper has been clocked at 43 m.p.h. with two men aboard. Multikeel hull makes for smooth ride.

Floating Patio

Want to throw a party? Take the gang fishing? Go off on vacation? Try the fast-moving Clipper

By Jim Roe

HERE'S something new: a floating "front porch" capable of moving itself and you over into a new neighborhood at a speed upwards of 40 m.p.h. It's the 20-foot Ambassador Clipper, designed and built by the Ryan Boat Co. and offered for sale this year by Ambassador Industries of Kansas City.

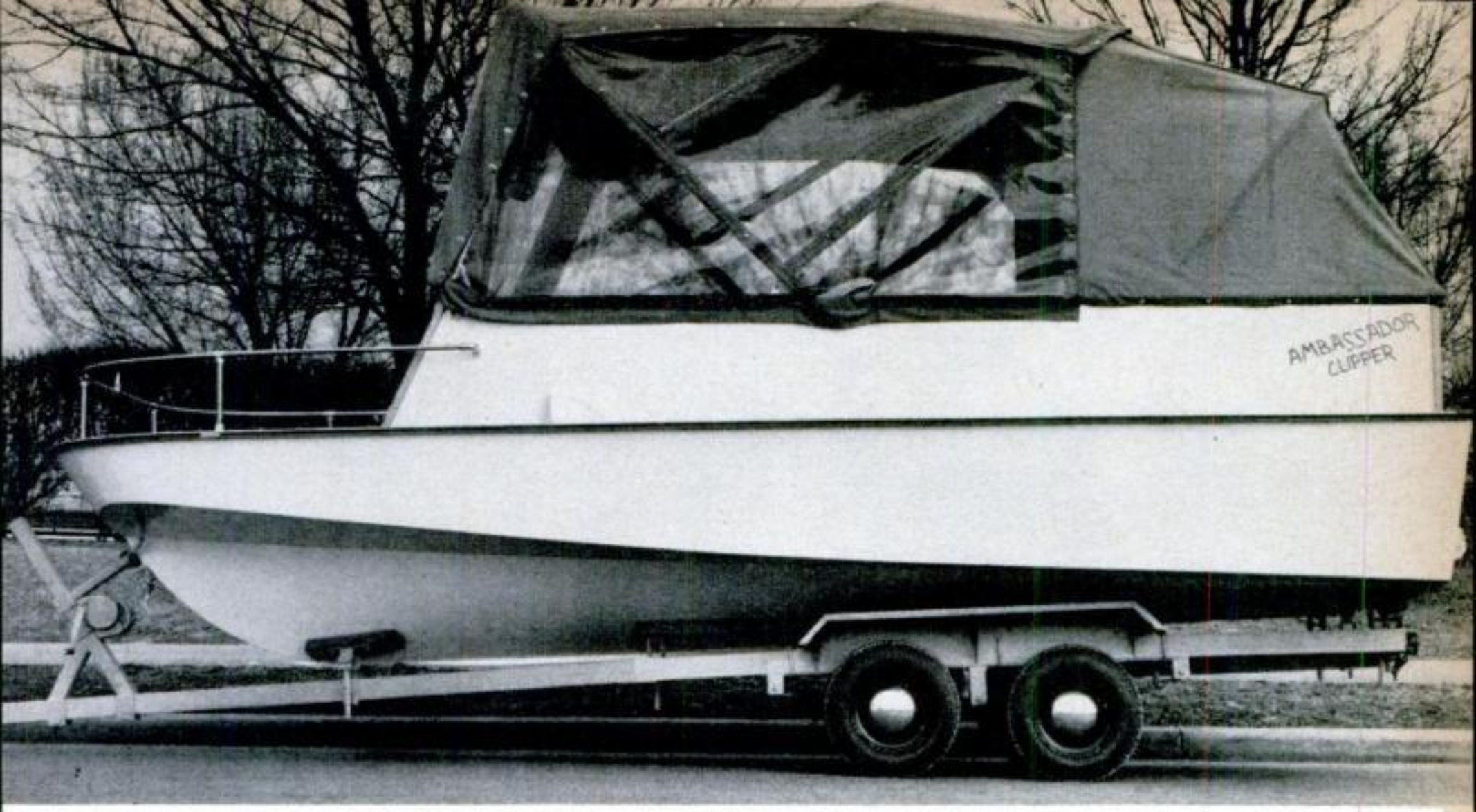
The Clipper combines the seaworthiness of a multikeel hull with the acreage of a flat-top deck. It's powered by a 120-hp. OMC stern-drive engine, and sold as a complete package of steering, lights, controls, 45-gallon gas tank, rudder-position indicator on the steering wheel. Other standard equipment includes a bow rail, electric power tilt for the stern drive, horn, and even a navy top.

As with any boat, you have to look at two or three things all at once to evaluate its usefulness. These include hull design, quality and type of construction, power plant, and versatility of the usable passenger space. So let's start under the water and work on up.

What's under water? The multikeel hull has a center keel that cuts the water, throwing it up under the hull into what is in effect a tunnel on each side of this keel. The displaced water is then deflected downward as it proceeds out toward the "wing" keels on each side. The tunnel effect supplies lift for the Clipper, and also protects the deck from spray.

The hull gradually flares out to a nearly flat bottom in the rear. This helps it get up on plane and makes for a high top speed. It also aids in the stability of the boat at rest or at slow speeds, particularly when passengers shift from one side to the other.

Thus the Ambassador Clipper joins a rapidly growing family of multikeel boats [see "Big Boom in Multikeel Boat Bottoms," PS, Dec. '64]. These multikeel craft have given a fine account of themselves with high speed in smooth water and relatively



For camping aboard, this cockpit cover provides weather protection with over six-foot headroom.

Does 40 m.p.h.

high speeds in choppy water. In choppy water, particularly, they have shown a marked stability and freedom from excessive rolling and pounding. The designers of such hulls have had a common objective: to obtain the stability of a catamaran or trimaran, the soft ride of a tunnel hull, and the speed of a hydroplane—all in one handy package.

The Clipper's hull is fiberglass, with a balsa-wood core. Two plywood stringers running the length of it, and two-by-fours running vertically, are formed into the fiberglass to provide rigidity and help eliminate vibration and water noises. The inside of the hull has cubes of balsa wood molded into the fiberglass bottom construction. They help give additional strength, and also provide buoyancy.

The construction and design combine to form a craft able to take it in the rough water offshore, yet ideally suitable for spooking around back-country rivers and

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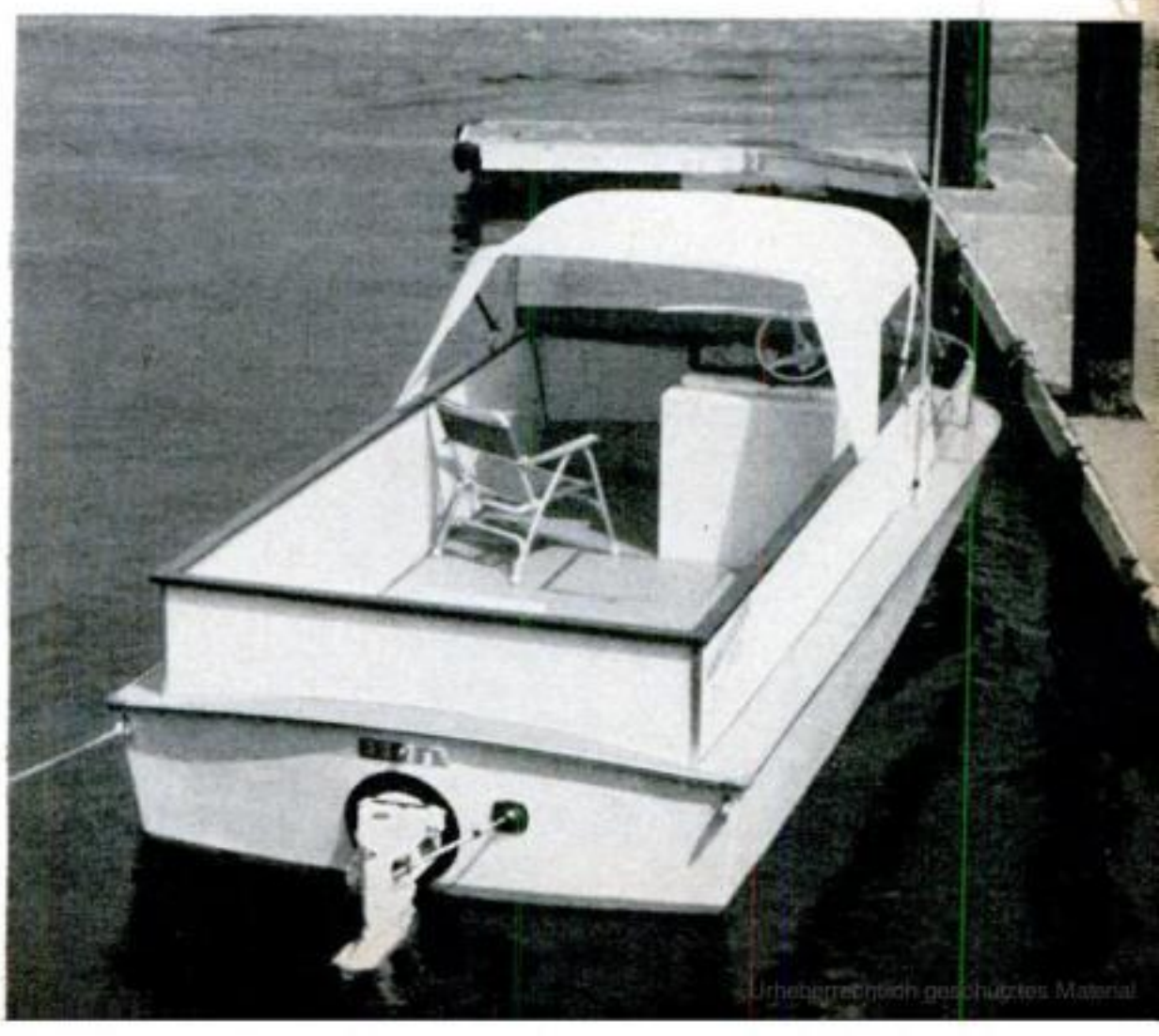
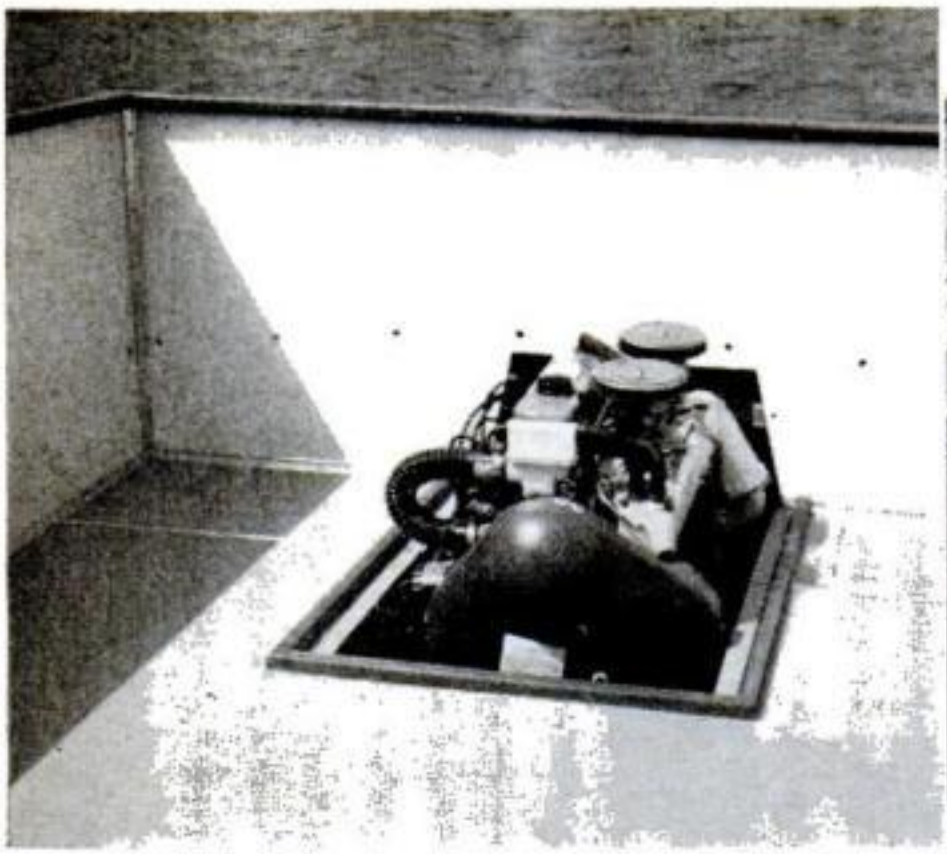
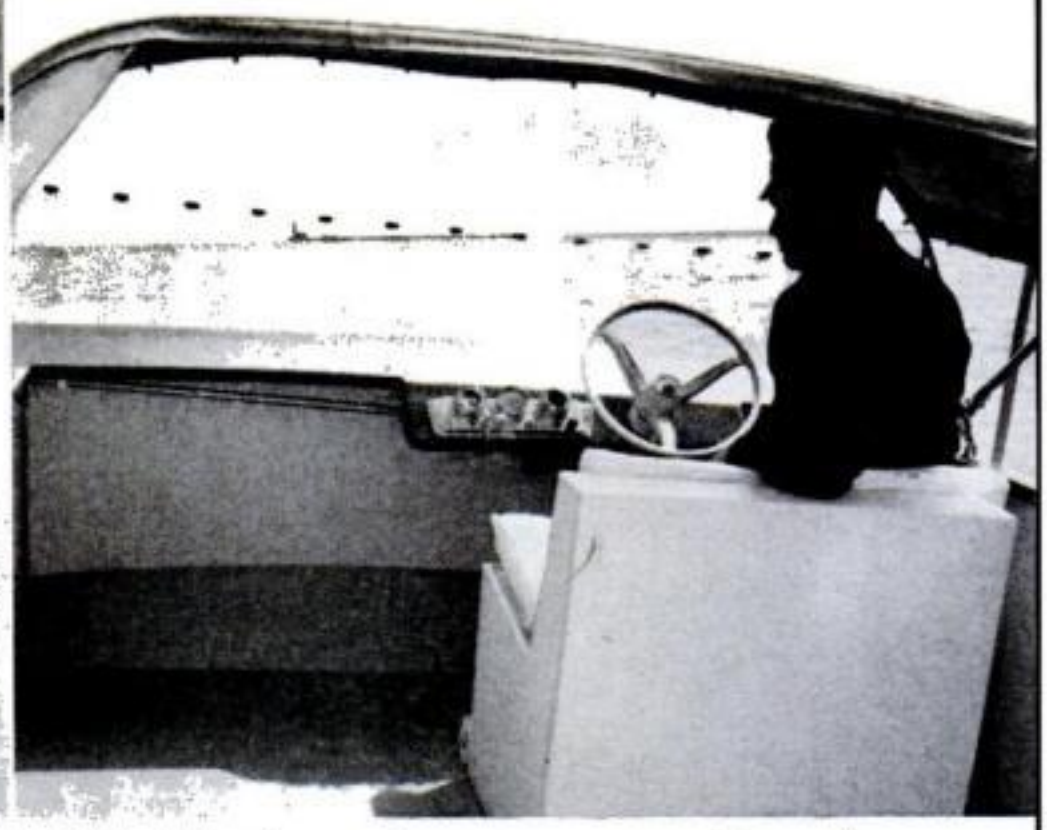


Uncluttered deck area measures 6′ 5″ wide by 13′ 7″ long, and there's forward sun-deck space 7′ 11″ wide by 4′ 10″ long for a fishing platform or for sunbathing. A 120-hp. OMC stern drive provides power. Drive unit is equipped with electric power tilt (full 75-degree arc) and remote electric shift.

Urheberrechtlich geschütztes Material



Engine with 120 hp. is same basic motor that powers the Chevy II. It's attached to stringers on Clipper's hull, and stern-drive unit attaches directly to motor—not to the transom.



Built-in driver's seat has storage space beneath. There is a rudder-position indicator in the steering wheel. Boat comes complete with instrumentation, lights, controls, and a navy top.

small lakes. Total weight of the boat is about 1,800 pounds, so it is easily trailered and can be launched and recovered quite handily.

What will she do? In tests, the Clipper has lived up to its name by clipping along at up to 43 m.p.h. with two adults aboard. This, of course, was with the top down and under favorable water conditions. The solid center keel is designed to prevent wandering at these high speeds, and also helps insure against side-slipping in a turn.

The Clipper is described as a "family fun boat"—and she's ready to keep up with you even if yours is a large family. It can handle as many as 14 people, when rigged as an excursion or sightseeing boat, and still leave the forward sun deck free. The large main deck area will take many arrangements of deck furniture or cots. There's lots of room, too, for any sort of party you want to throw, from an "all the gang" fishing party to a bunch of teen-agers pounding the deck with the latest dance.

If you like sun, just put the top down and you can get all that Nature is providing at the moment. If you want protection from the weather, there is a completely enclosed canvas top, as shown in a photograph. This has 6′ 3″ headroom and gives you lots of covered space for overnight camping, or for fishing and boating in the rain. There is under-deck storage providing plenty of space to hold water skis, fishing equipment, skin-diving gear, picnic lunches, and beverage coolers. There is also storage under the pilot seat for smaller articles such as life preservers, fire extinguishers, and flashlights.

What gives it go? The Clipper gets its power from a 120-hp. OMC stern-drive engine. The stern drive is not mounted on the transom, but is directly connected to the motor, which in turn is mounted securely on motor mounts formed in the fiberglass bottom. All my tests on boats with this power-plant-and-drive combination have shown it to be exceedingly quiet. Rubber mountings isolate the engine from the hull and you often have to look at the tach while the motor is idling to be sure that it's really going. There is a full electric shift—with a choice of pushbutton or single-lever control.

The power tilt is electrically operated from the driver's seat.

The entire power plant—as reliable as they come—carries a two-year guarantee. But should the day arrive when you need repair parts, they're not hard to come by: The motor is the same one that's used in the Chevy II.

Built in California by Ryan, the Clipper has been extensively tested in both inland and offshore waters. Of course, no one boat has everything. If you hanker for a built-in galley, built-in bunks, and lots of privacy aboard, this is not the craft for you. But if you're one of the growing number of those who enjoy a seaworthy craft with lots of fresh air and room for entertaining aboard, this boat is one you will want to test-drive for yourself. ■ ■

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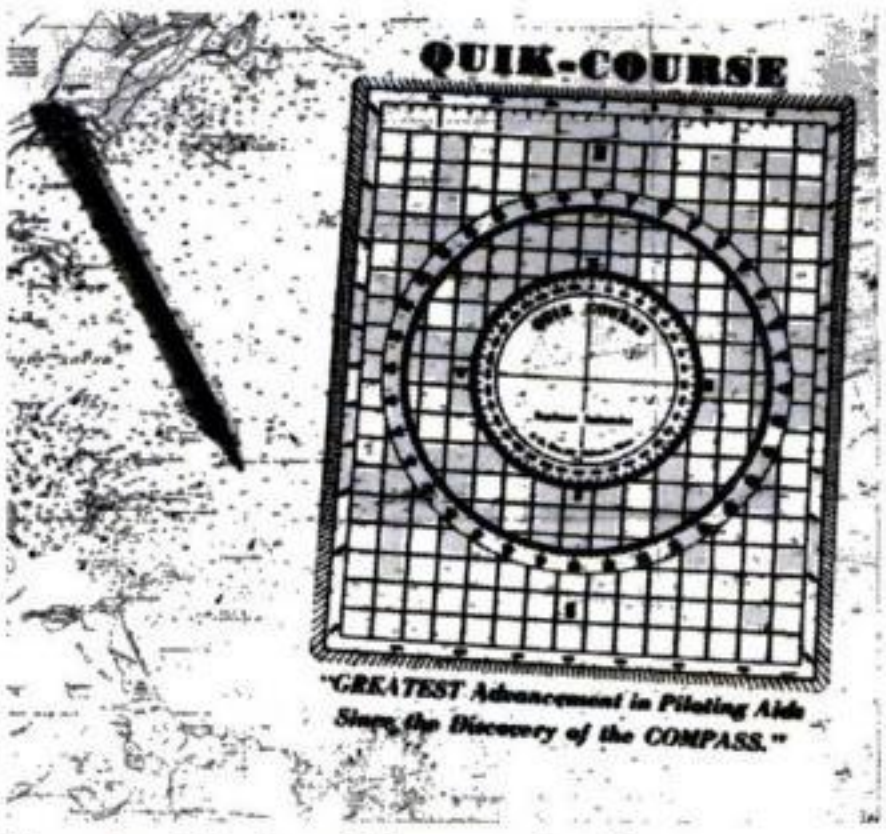
what's new in BOATING

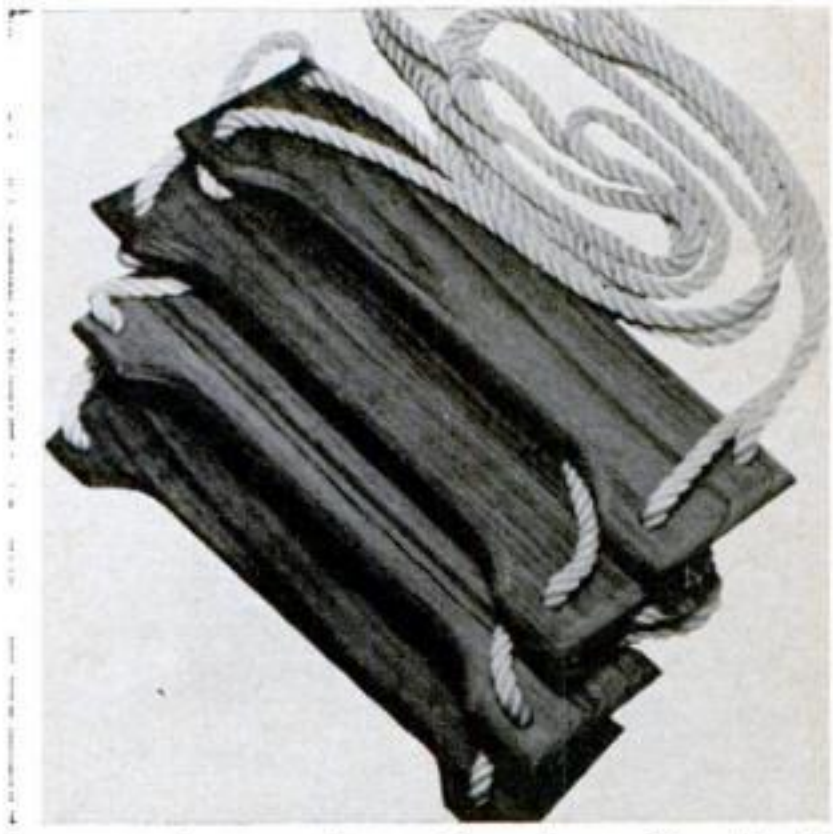
A Tiger That Swims Hits the Water

THE new El Rey sport runabout is described as a real tiger on the water. It's hull is an "increased-V" design, with a deep V forward and a wide V aft. Length is 16 feet. The boat can be equipped with outboard or stern-drive power. Maximum recommended hp. is 150. Other attractions: mechanical steering, full instrument panel, spring-cushioned driver's seat, rear-view mirror. Dorsett Marine, Bremen, Ind.



Handy aid simplifies navigation

This see-through course finder also helps you plot position and measure distances. Place the center of the Quik-Course on your course line, line up straight lines with chart lines, and read off true course. $3.95. Bay Front Industries, Nahant, Mass.



Low-cost, easy-handling boarding ladder

Need a good low-cost boarding ladder? This one by Sea/Line is teak, needs no varnish, comes in four- or six-step sizes, assembled or as a kit. Finished four-step ladder is $12.95 plus postage. West Products Corp., Box 707, Newark, N.J.

V-flare fiberglass cruiser offers a choice of stern drives

Just under 20 feet long, with a 91-inch beam, the Waverly gives you a choice of stern drives from 110 to 185 hp. It comes with steering, a helmsman's seat, full instrumentation, and bunks with foam mattresses. There's space for galley and head, too. Alpex Corp., Minneapolis.

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WATER SKIING Is Easier Than It Looks

By Wayne Heyman

1 **First step** in dry-land instruction is to be sure the skis are properly adjusted. This is easier if feet and ski bindings are wet. Practice will determine the exact snugness desired.

WATER skiing is one of the fastest growing outdoor sports in the nation. Less than 20 years ago, there were only a few thousand skiers. This season, an estimated 500,000 new ones will join them, shelling out nearly $78 million for skis, wax, towropes, and outboard rigs with the latest in featherweight, high-powered engines.

Water-skiing equipment is among the least expensive items in the sporting stores. A good pair of skis can be bought for $17 to $35, and a towline with floating handle for $3 to $12, depending upon length and quality. Used skis can be picked up for practically nothing and, if need be, a towline can be made from 25 to 50 feet of ¼-inch manila clothesline. A life belt, which should always be worn, sells for under $5.

Choosing your skis. Usually made of laminated wood bonded with a waterproof adhesive, a typical pair of skis would be a half-dozen inches wide and a bit less than six feet long. Hickory is the most favored wood, but skis made of fiberglass (lighter than wood) are fast becoming common. The beginner should beware of buying skis that are too heavy—too wide and too long. He will find them discouragingly hard to maneuver.

The biggest expense in water skiing is, of course, the tow—the boat and motor. For minimum power, you need a 14-foot lightweight utility or sports runabout equipped with a 10-to-15-hp. engine. This package provides just enough speed to plane a 150-pound skier at about 15 m.p.h. A craft of this type will cost around $380, depending on construction material—fiberglass, aluminum, or wood. The engine will cost between $250 to $400. Used equipment costs a third to half as much.

How fast do you go? Most water skiing by amateurs is done at around 20 to 30 m.p.h. A 25-hp. engine on a 16-foot runabout can tow several riders at this clip. Professional skiers usually work behind an

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2 Beginner now sits back on the skis, feet positioned about six inches apart, knees together, and grasps the tow-bar handle. The instructor exerts a steady pull on the line.

3 Practice pull-ups give the beginner the feel of the tow boat and help familiarize him (or her, as in these photos) with the trick of balancing against the tension of the line.

outboard with a twin-motor installation or a large 75-hp. job to provide the high speed required at shows or while competing. Rarely does any novice need more than 18 to 20 m.p.h. for the first few weeks. In fact, professionals seldom exceed 35 m.p.h., and then only for barefoot skiing and (men's) jumping.

Speeds above 30 m.p.h. *will* increase the thrill, but they also increase the risk of losing control over the skis. Although it is rare for a skier to collide with any object in open water, a spill at 40 m.p.h. can be pretty rough. Spills under 25 m.p.h. are cushioned by the water.

Is it dangerous? The same safety rule applies to water skiing as to any other fast-paced sport: The game is as safe as the participants make it. Night skiing is dangerous because visibility is poor. Shallow-water skiing can also be hazardous since there is a risk of snaring the skiis on the bottom. The rider can be thrown forward, to suffer sand or rock scratches, perhaps broken bones. The simplest way to avoid injuries is to become well acquainted with any water area you intend to ski across.

During the last 20 years that the American Water Ski Association has been sponsoring tournaments, there has never been a fatality. In Florida, many major ski schools have been operating 10 or more years, yet none has reported a serious accident or fatality. This safety record has been maintained in areas where skiing is done steadily for as much as 10 hours a day, seven days a week.

The quickest and safest way to learn is to start on land. The first few practice lessons should be staged on the beach where there is plenty of water to wet down the feet and adjust the skis correctly. But, if

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4 **Always wear a life preserver**—either jacket or belt—when water skiing. This protects the skier and relieves the pilot of the tow boat of worry. In most areas it's the law.

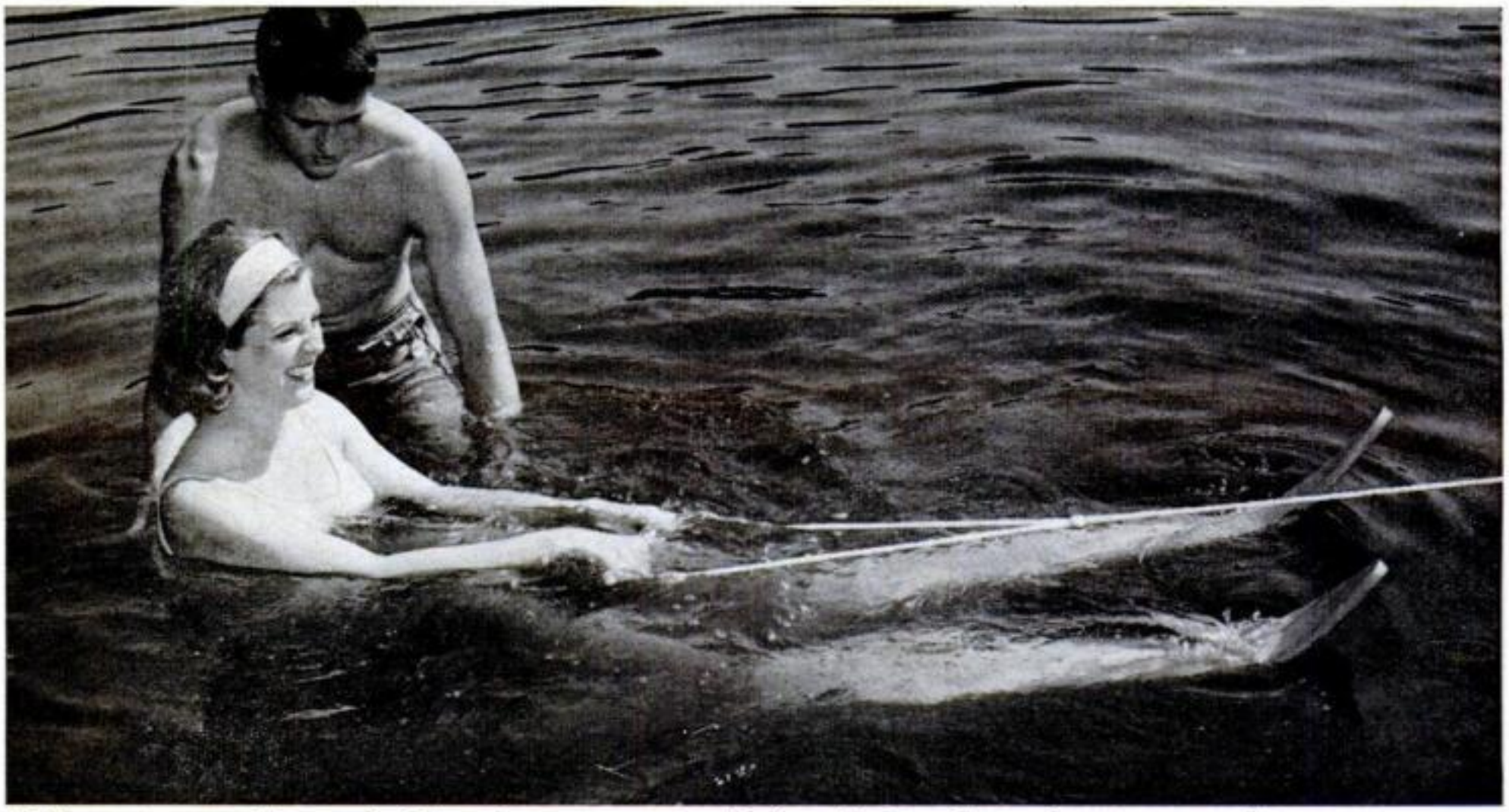
necessary, the lessons can be tackled in your back yard or even in the living room.

The photos on these pages show the training steps. The first few hours of actual water skiing can put a tremendous strain on leg and arm muscles not accustomed to the sport. When the skier feels he has had enough for one session, he swings his arm in a downward motion, thumb down, and then points toward the dock. This is the recognized signal to head for shore. The boat driver then heads to the prearranged drop-off area where the skier simply lets go of the towline and coasts to a stop.

The basic maneuver. You'll soon discover that turning on water skis is far easier than turning on skates or attempting your first turn on a bicycle. It's a maneuver quickly mastered by most beginners. To move to the right, you simply shift the weight slightly in that direction so that more body weight is placed on the right ski than on the left. (It helps somewhat to lean into the turn and push out slightly with the opposite ski.) Just reverse this procedure when making a left turn.

More complicated maneuvers, such as crossing the wake or jumping, take time to build up the expert muscle coordination you'll need.

Water skiing got its start back in the Twenties. A group of French Chasseurs Alpine officers, in training for winter mountain



5 **Now to try the real thing** in water at least hip deep. The student crouches until the ski tips show above water, their stern ends resting solidly on sea or lake bottom.

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AWSA* signals—skier to boat driver

In gear: Shout, "In gear."

Start: Shout, "Hit it," or nod head.

Faster: With palm up, motion upward; or nod your head if both hands are in use.

Slower: With palm down, motion downward; or shake your head if both hands are in use.

R.P.M. required: Hold up number of fingers to indicate hundreds—thus, for 2,300, two fingers, then three fingers.

Speed okay: Make an "O" with thumb and forefinger.

Turn: Palm vertical, make curving motion in direction desired.

Jump: Imitate jumping arc with hand.

Stop: Hold up hand, fingers outstretched, like a cop.

Back to dock: Point, with a downward swing of the arm.

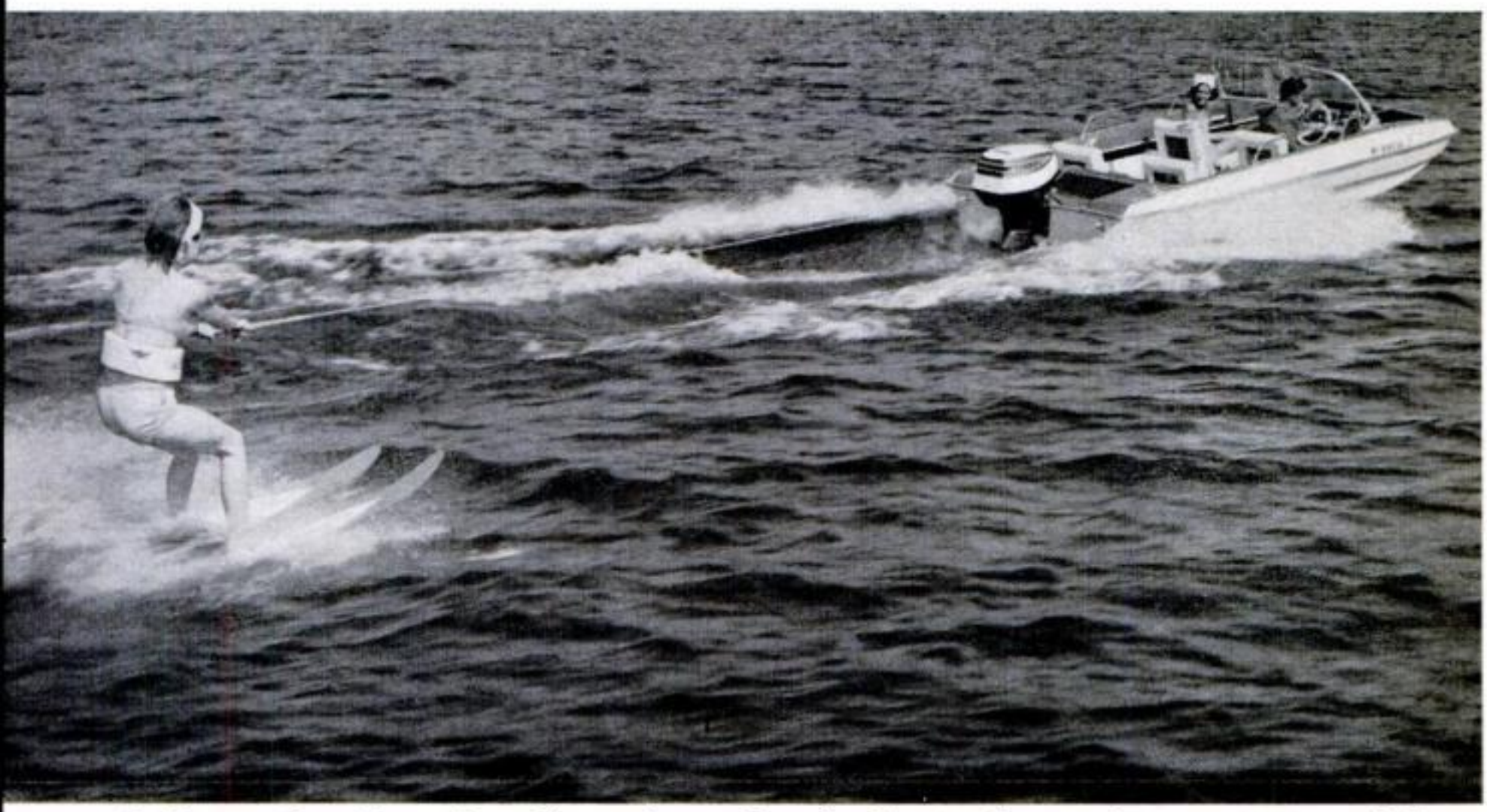
Cut motor: Draw finger across the throat.

**American Water Ski Association*

warfare, were relaxing on Lake D'Annecy, in the French Alps. Watching aquaplaners being towed behind fast-running inboards, one of the officers suddenly had an idea. Why not ski on water? Without saying anything to his companions, he slipped on his snow skis and tried it. That did it. The sport spread like wildfire up and down the French coast.

There was one drawback: Water skiing required boats, and boats with sufficient power were expensive inboards. The outboard of modest cost was yet to be born. So the sport was restricted to such resorts of the wealthy as Juan Les Pins on the French Riviera and Florida's Miami Beach.

Shortly after World War II, the boom in water skiing began. Commercially produced water skis, which had been available for a short time before the war, now came on the market at a reasonable price. Outboard motors appeared on every rivulet in the country. And skiers have been splashing happily behind them ever since. ■■



6 **Up on the skis,** with a firm grip on the tow handle, the student yells, "Hit it!" All he has to do now is concentrate on balance, knees flexed, and let the boat do the work.

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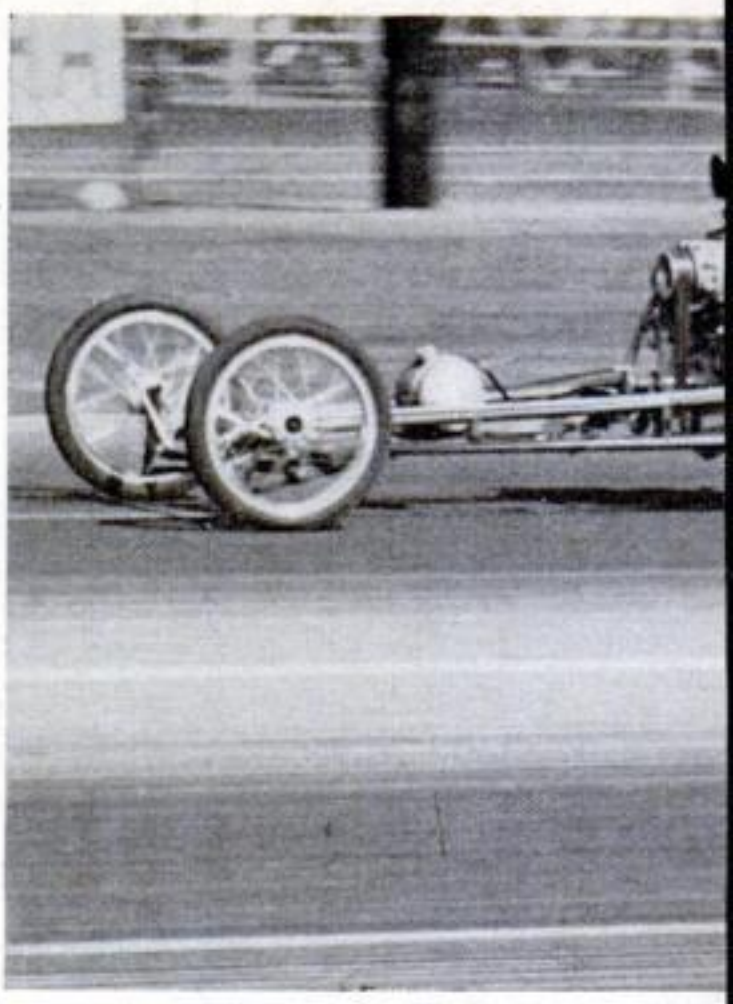
PS PICTURE NEWS

Roaring Beasts of the Drag Strips

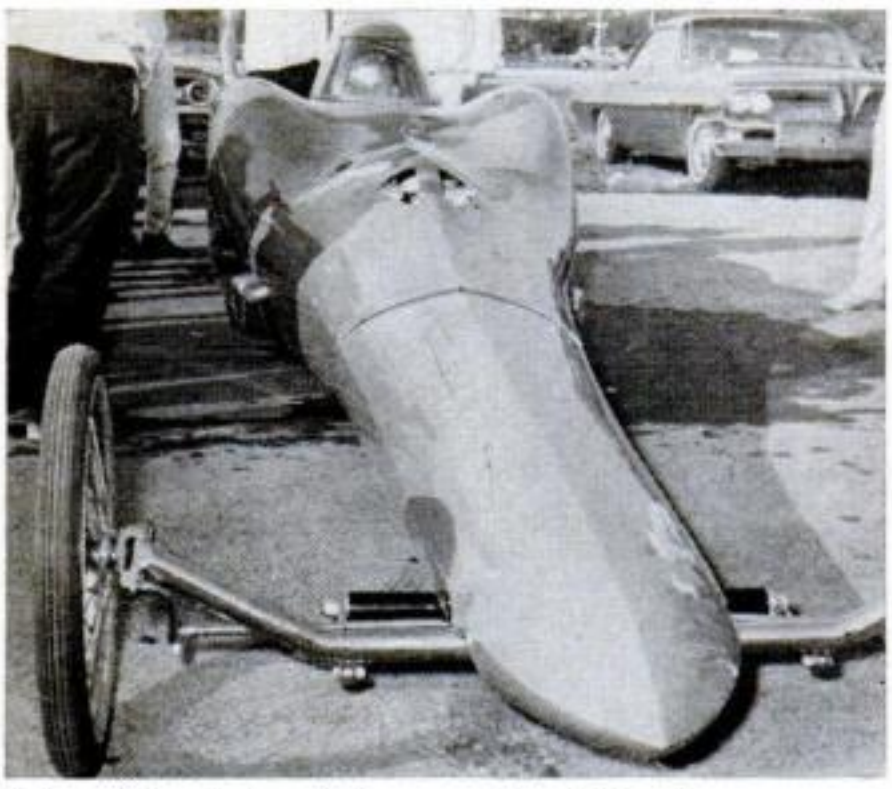
Acceleration racing, fancy name for drag racing, has become a leading sport—and the noisiest. It has produced amazing records: 206.88 m.p.h. for an eight-second quarter-mile. That may fall in the National Hot Rod Association spring meet June 3-6 in Bristol, Tenn.

The dragsters shown here are in the two top classes of a total of 13. Most are fuel dragsters burning an exotic brew of up to 90 percent nitromethane. Some gulp the same gasoline used in the family car—but faster.

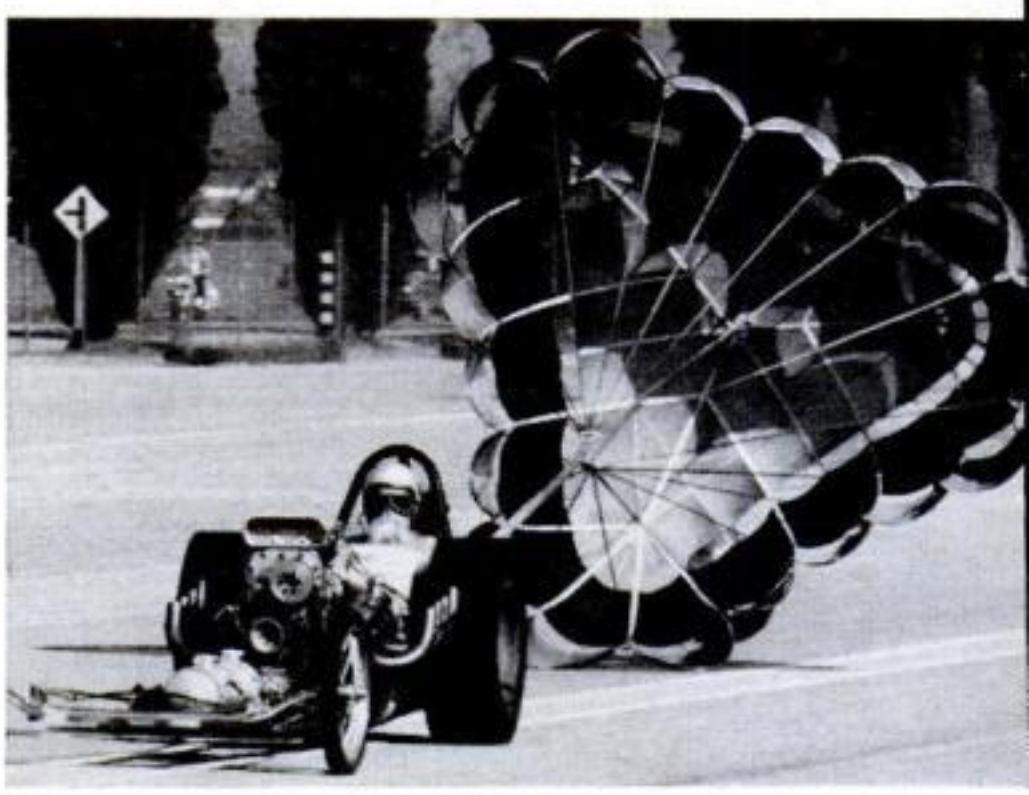
In 1,904 NHRA-sanctioned meets last year, 284,043 cars roared down quarter-mile straightaways as 3,312,542 onlookers paid to cheer. The year also saw 200 m.p.h. broken—chiefly through fuel-injected, supercharged engines, better tires, improved lubricants. The powerful engines churn out as much as 1,300 horsepower.



Typical drag-race start shows two

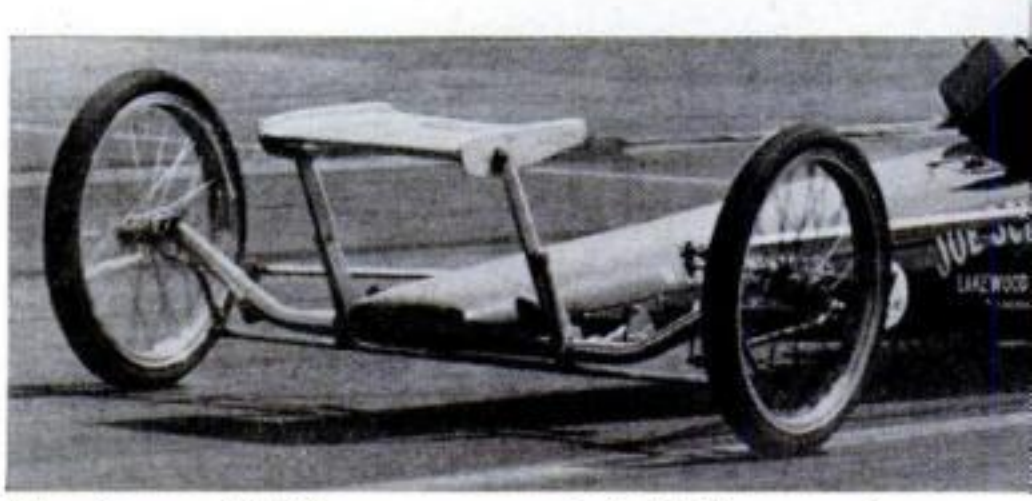


Streamlined hood is new trend in drag racers. Driver Maynard Rupp's head is barely visible under cockpit canopy. Injected Chevy 370-cu.-in. V-8 engine can deliver more than 800 hp.



Parachute brake, yanked from rear compartment by release of small spring-loaded pilot chute, helps stop dragster while speeding at more than 150 m.p.h at end of its quarter-mile dash.

Sculptured cockpit of Kenny Safford's supercharged Chrysler-powered car is strictly for looks. Packed braking chute is in rear midsection. This dragster has exceeded 200 m.p.h.



Aluminum airfoil over nose, slanted downward before race, helps hold front end on track. Joe Schubeck's car has injected, supercharged 400-cu.-in. Chrysler engine developing 1,300 hp.

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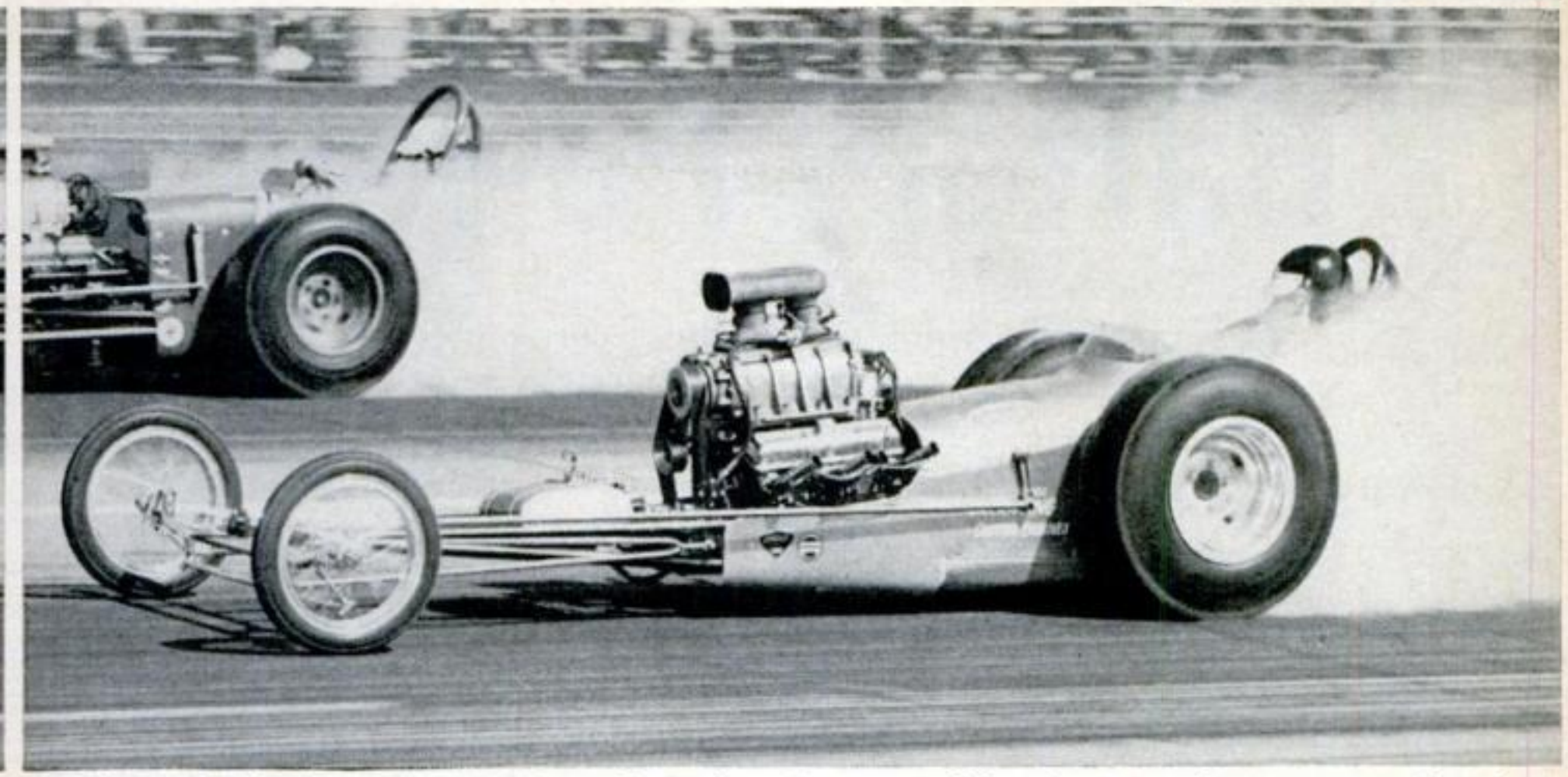
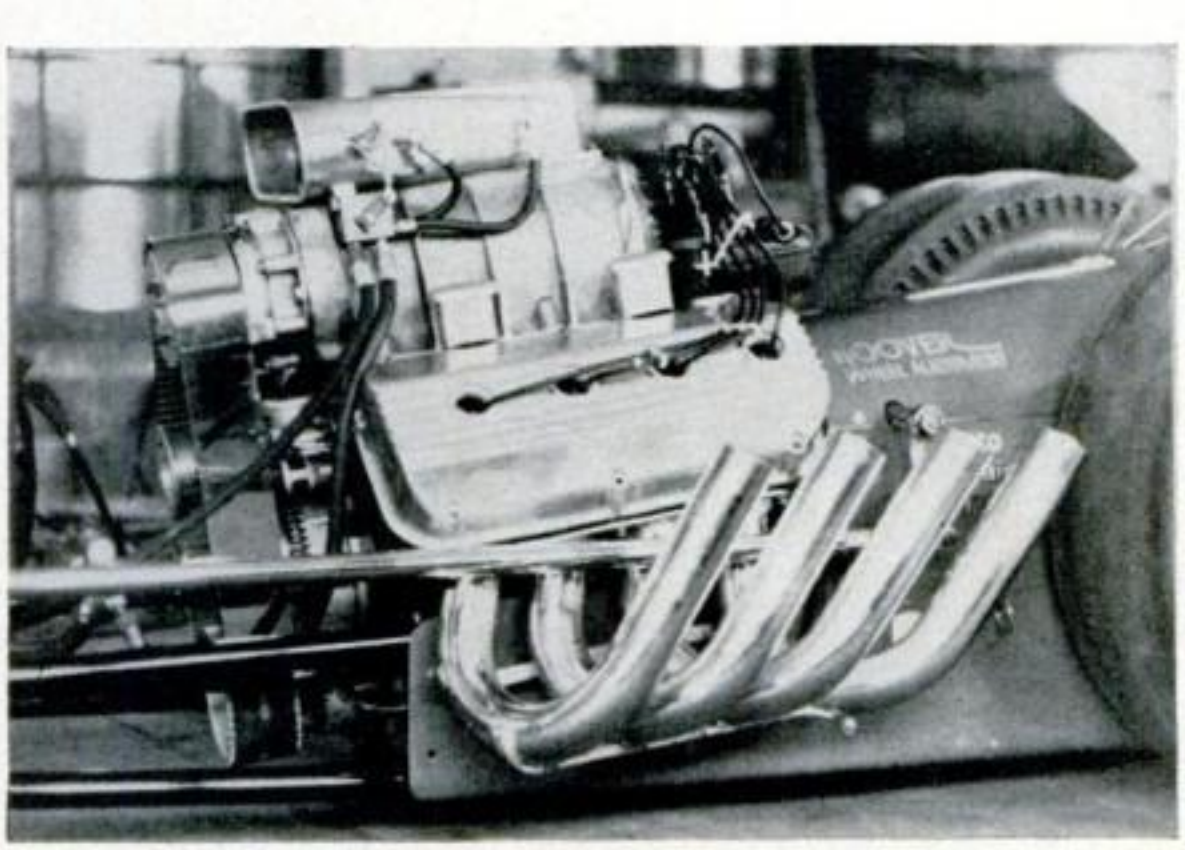


hot-rod Chevies competing. Supercharged engines, topped by air scoops, increase r.p.m. five times.

At butterfly wheel of gas dragster, George Bolthoff set an NHRA class record, driving a car with a supercharged '57 Chrysler engine at 185.18 m.p.h. over quarter-mile course in 8.33 seconds.



Upward twist of exhaust pipes, called "zoomies," blows smoke away from driver, heats tires and thus improves traction. Tom Hoover's supercharged 354-cu.-in. Chrysler-engine car can do 200 m.p.h. From Minneapolis, it's among Midwest's fastest.

Eerie-looking garb is required. It consists of safety helmet and aluminized flame-resistant face mask, suit, and gloves.

Urheberrechtlich geschütztes Material

Build your own

Battery-Powered

A unique power supply and a miniature bulb let you enjoy trouble-free lighting anywhere there's a 12-volt battery

By Howard G. McEntee

WHY a battery-powered fluorescent lamp? It may seem as silly as air conditioning in the Arctic, but it really makes good sense. Fluorescent lamps are about four times more efficient than incandescent lamps, their light is cooler and almost glarefree, and they are more reliable —long-life fluorescent bulbs fail gradually, with plenty of advance warning. Battery power lets the lamp work in a car, on a boat, at a camp site, or any place where a 12-volt battery is the only convenient source of power. Just plug it in.

Here's how it works: The miniature type F-8 fluorescent bulb is lit by a unique DC-to-AC power supply: It generates short high-voltage pulses that go directly to the bulb—no starter or ballast is necessary. Brightness is controlled by varying the frequency of the pulses; slide switch S2 selects either 1,800 or 3,500 pulses per second for high or low brightness, respectively.

Building it. Start by making transformer T1 and choke Ch; both are wound on doughnut-shaped cores (see parts list). Cover the bare cores with a single layer of cellophane or plastic tape to prevent any rough spots from nicking the insulation of the winding.

Ch1 consists of 11 turns of No. 20 Form-

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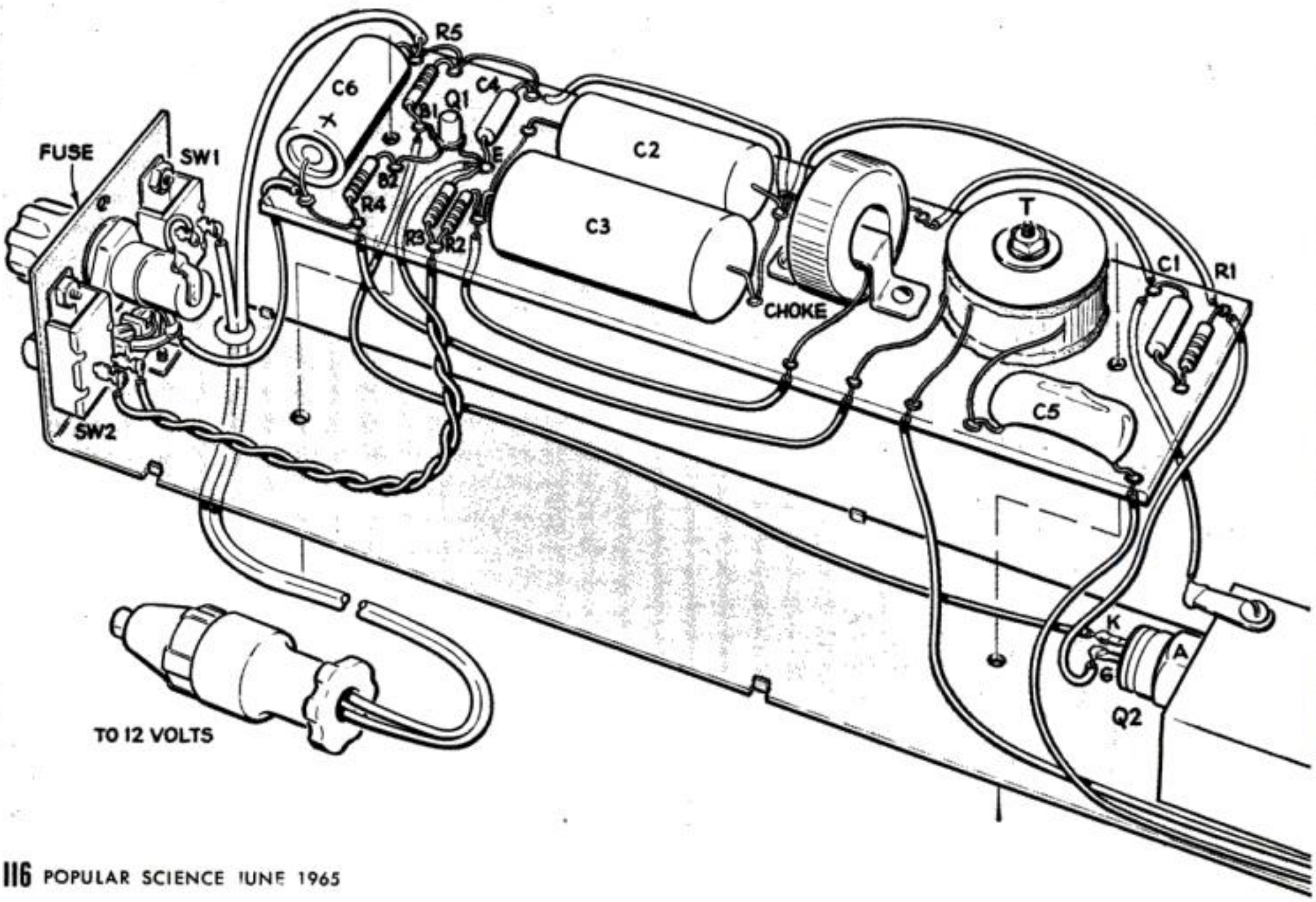

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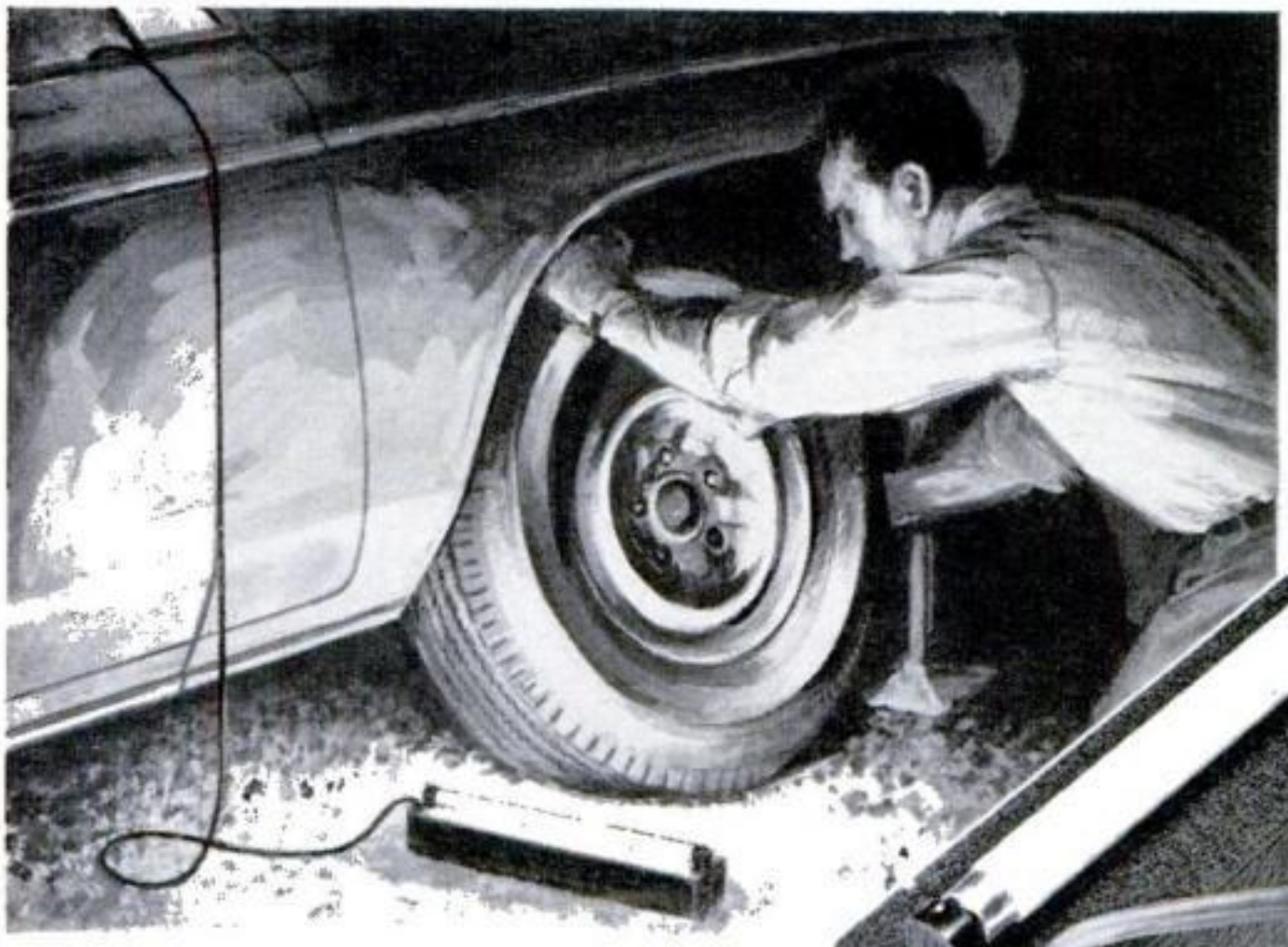
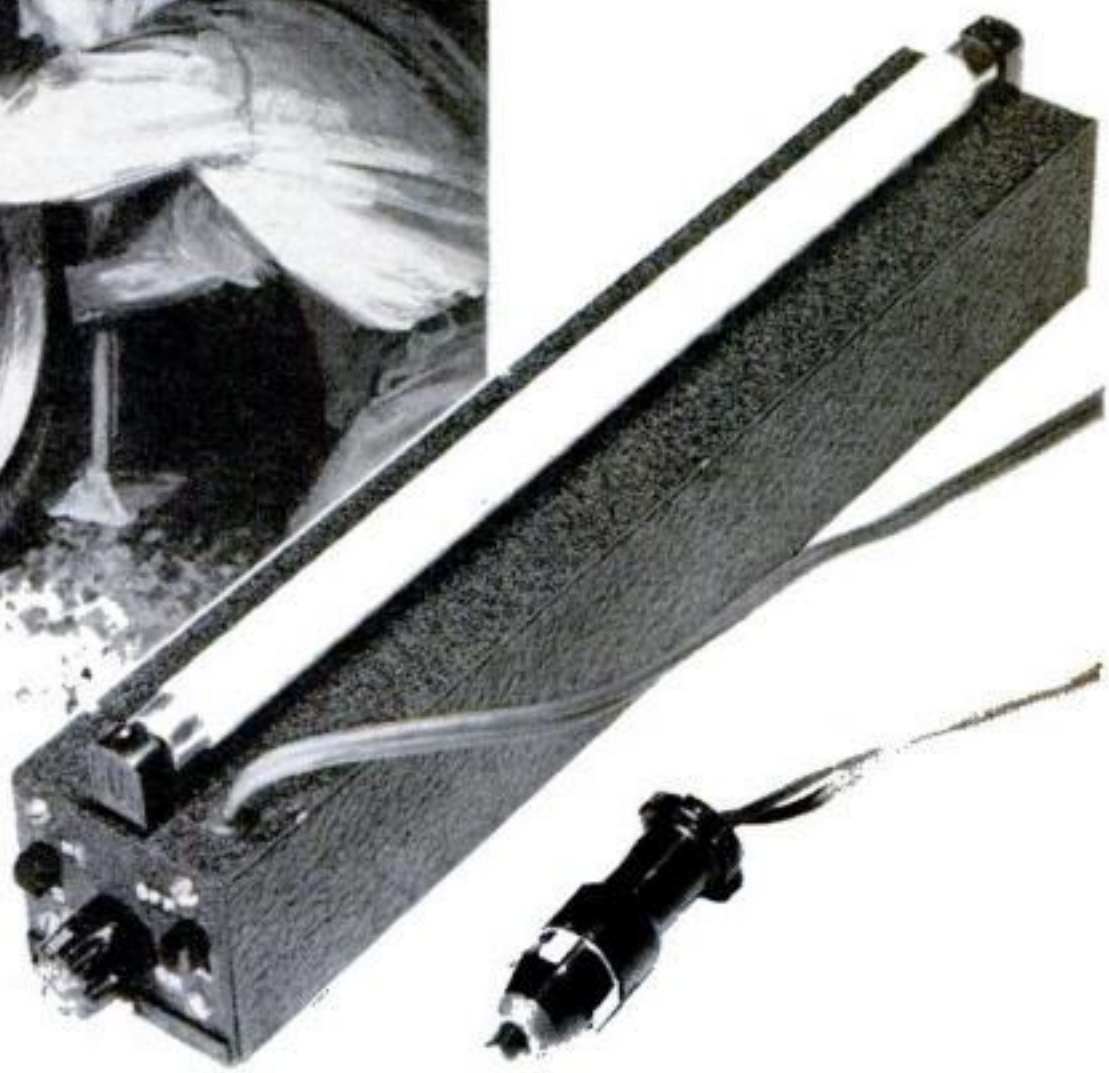
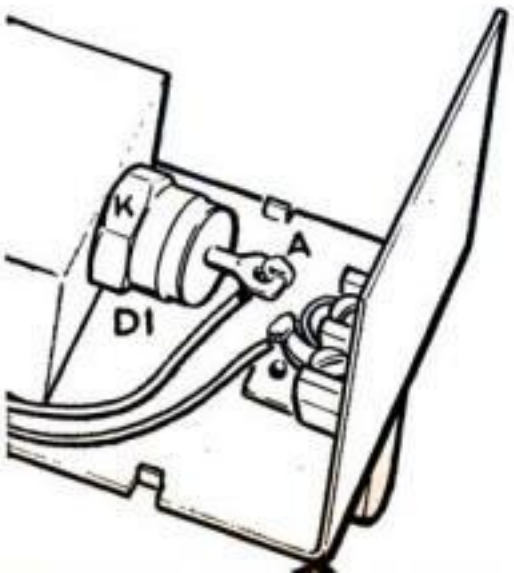
Fluorescent Light



PS ELECTRONICS



Slim fluorescent bulb lights a wide area uniformly. To beam the light, add a simple metal reflector under the bulb. Total cost of the lamp is about $17.



When the light is on, transformer T1 and choke Ch1 may emit a shrill whistle—it's caused by vibration of their windings at the power supply's operating frequency. To silence them, coat windings with "transformer varnish" (available at motor repair shops) or with RTV silicone rubber.

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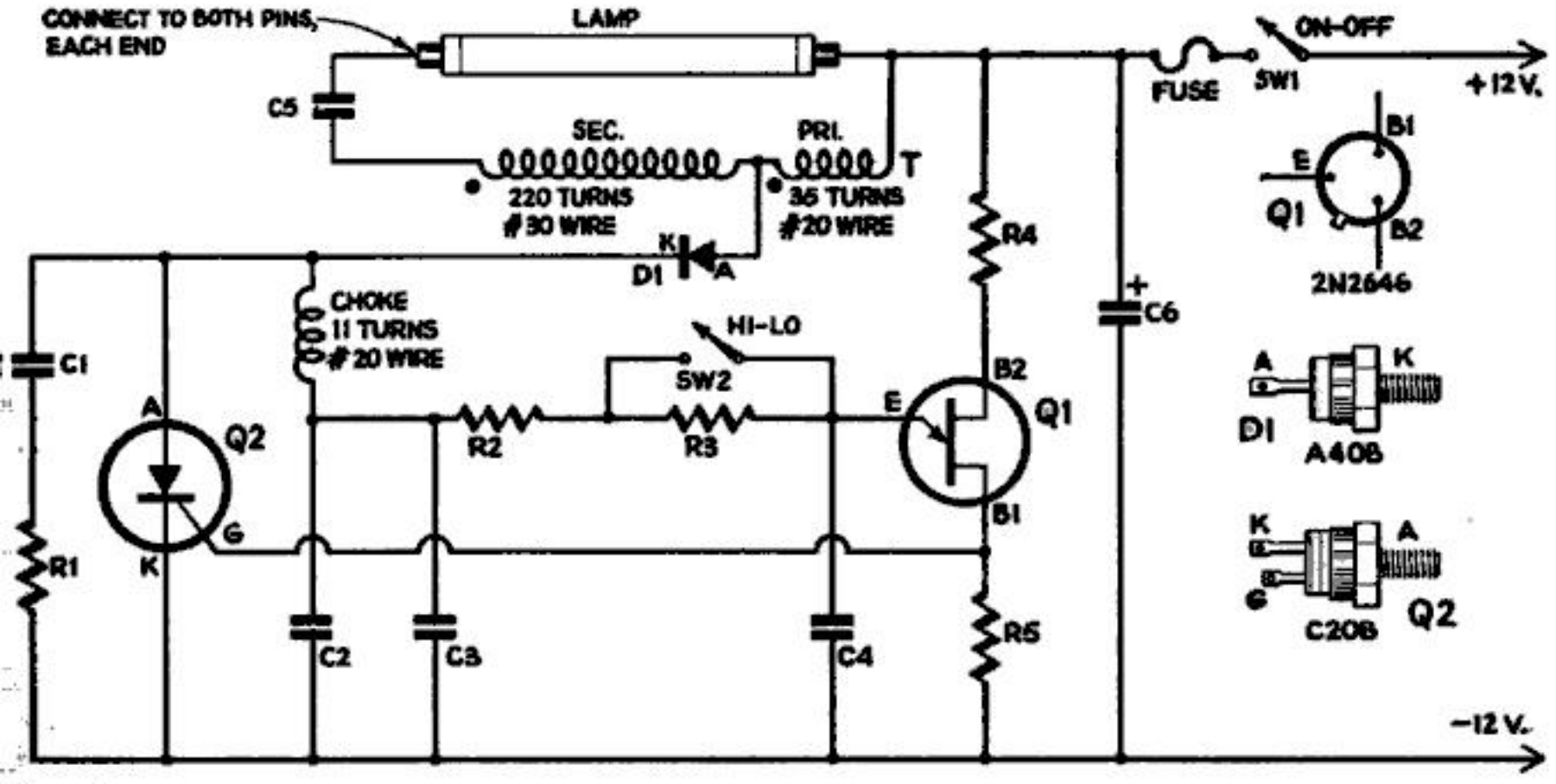


PARTS LIST

R1—68-ohm, ½-watt carbon resistor
R2—100,000-ohm, ½-watt carbon resistor
R3—150,000-ohm, ½-watt carbon resistor
R4—220-ohm, ½-watt carbon resistor
R5—47-ohm, ½-watt carbon resistor
C1, C4—.01-mfd., 100-volt mylar capacitor
C2—1-mfd., 200-volt mylar capacitor
C3—2-mfd., 200-volt mylar capacitor
C5—.003-mfd., 600-volt mylar capacitor
C6—100-mfd., 15-volt electrolytic capacitor
Q1—GE 2N2646 unijunction transistor
Q2—GE C20B silicon-controlled rectifier
D1—GE A40B silicon rectifier
SW1, SW2—SPST slide switch
Lamp—GE type F8 fluorescent lamp and two end sockets
T1, Ch1—See text. Both wound on Arnold #930157-2 toroid cores; $1.50 each postpaid from Dao Corp., Box 659, Terra Haute, Ind.
Misc.—Black crackle-finish steel case 12"x2"x1¾" (LMB #15); Formvar magnet wire (see text); phenolic chassis board; mica sheet (see text); lighter plug; line cord.

var-insulated magnet wire wound tightly on its core. You'll need about 18" of wire. Space the turns so that they cover about ¼ of the core's circumference. Cover the winding with a layer of plastic electrical tape to hold it in place.

T1 has two windings—a primary and a secondary—wired in series. To wind the secondary (it goes on the core first), you'll need a simple "shuttle" or bobbin. Make one by cutting ¼"-deep notches in an 8"-long piece of ¼" wood dowel. Wind about 30' of No. 30 Formvar magnet wire on the shuttle. Temporarily tape the free end of the wire to the core. Continue passing the shuttle through and around the core until you have wound 220 turns on it. Lay the turns flush against each other; they should form about two even layers around the inside of the core's center hole. Wrap a layer of plastic tape over the completed secondary before winding the primary.

The primary contains 35 turns of No. 20 Formvar wire (a 4' length of wire should be enough). Begin it at the point where the secondary wiring ends, and be sure to wind it in the same direction along the core.

The chassis. Make a chassis out of a piece of phenolic board; use eyelets as soldering points. Mount Ch1 on the chassis with a homemade aluminum strap placed on the section of core where there is no winding. Mount T1 with a single bolt and washer through its center—put a small piece of cardboard under the washer.

Diode D1 and silicon-controlled rectifier Q2 must be mounted on a heat sink. Make one from a 1¾"-by-1¾"-by-⅜" or larger aluminum block.

The block must be insulated from the case electrically, but not thermally—in other words heat must be allowed to pass freely from the block to the case so it can be lost to the outside air. To accomplish this, place a thin sheet of mica between the block and case—mica conducts heat, but not electricity. Use insulating shoulder washers on the screws holding the block to the case. You can salvage a suitable sheet of mica from an old electric iron or toaster, or you can purchase one from many electrical-appliance repair shops. ■■

Urheberrecht ch geschütztes Mater al

Concord 330 has 15 assorted knobs, levers, and buttons—an impressive array for a briefcase-size recorder. With batteries and front cover, it weighs about seven pounds. The 330 uses easy-to-get 5" reels of tape.

what's new in ELECTRONICS

Personal-use report:

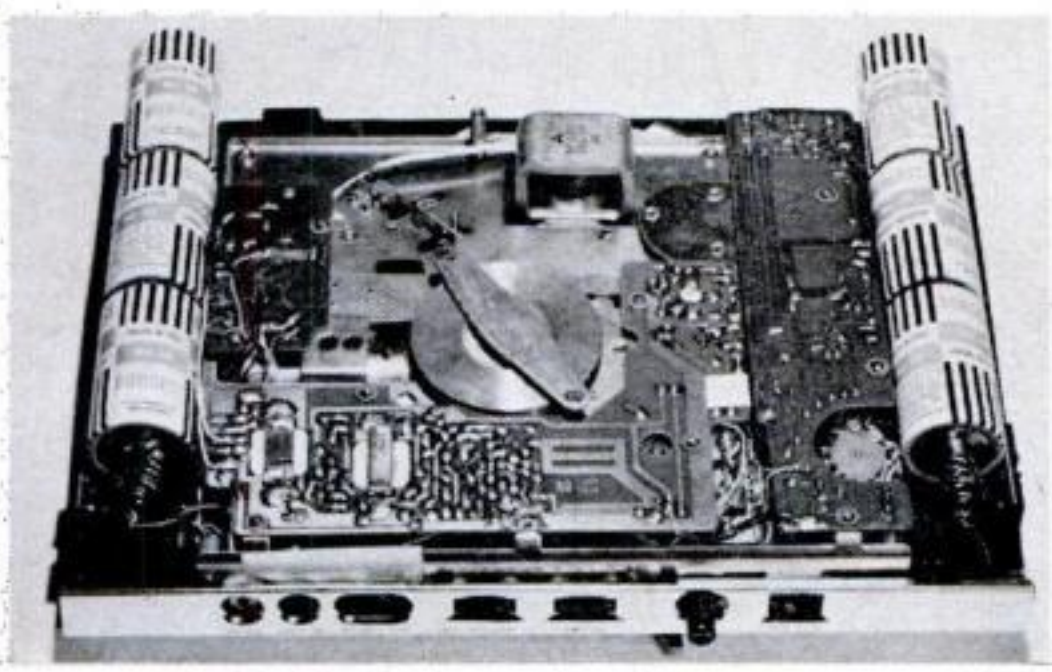
The Midget Tape Recorder That Thinks for Itself

THE Concord 330 looks like an ordinary, full-size tape recorder that got in the way of a steam roller: It's less than 4" thick. But this battery-powered, carry-anywhere tape machine is far from ordinary.

Flip the function knob to "Voice Operate," and the 330 waits—reels motionless—until the mike picks up a voice or sound. Then it automatically starts recording. Two seconds after the voice or sound ends, the 330 turns itself off. The delay prevents pauses between sentences from stopping the recorder prematurely. I have only one criticism of the voice control: The 330 misses the first few syllables it hears, since it takes a small—but noticeable—fraction of a second for the reels to start turning.

Two of the 330's other tricks:

- Automatic stopping at any point on a reel of tape. The secret is a piece of adhesive-backed metal foil that is stuck to the tape at the desired stopping point. A sensor in the head assembly detects the foil when it passes, turns off the drive motor. To restart, flip the switch to "manual".
- Automatic slide advance of most motorized 35mm slide projectors. Metal foil placed at appropriate points on a taped sound track triggers the projector's advance mechanism.—*R. Benrey.*



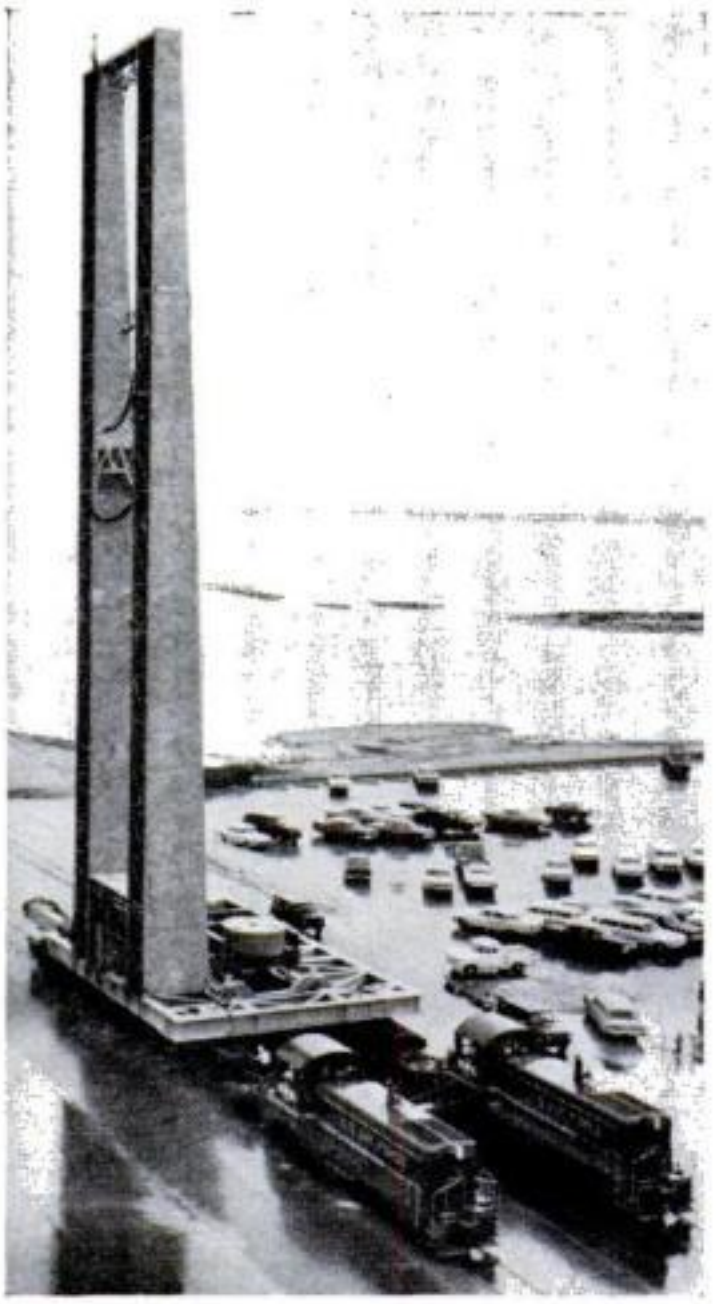
Big flywheel (center) and governor-controlled capstan motor keep the tape speed remarkably constant for a battery-powered (six D cells) machine. Fidelity? As good as an AM radio.

Five-position function switch is the only visible clue that the 330 contains voice-control circuitry. The "manual" position transforms the machine into a conventional recorder.

Urheberrechtlich geschütztes Material

Robot dialer has memory for numbers

A new Bell automatic dialer gets your number at a press of a single button. An electronic unit with a memory for more than 400 numbers, Magicall can be connected to any phone. To register a new number on its magnetic-tape cartridges, or change an old number, you plug a detachable dial-in unit into the device and dial the number just once. The dialer has both a manual and motor selector for setting the proper cartridge into place for a call.



Mobile rocket-launch stand

Combination assembly, checkout, and launch stand, this 153-foot tower [PS, Jan. '63] is pushed by two diesel locomotives from assembly point to launch site at Cape Kennedy.

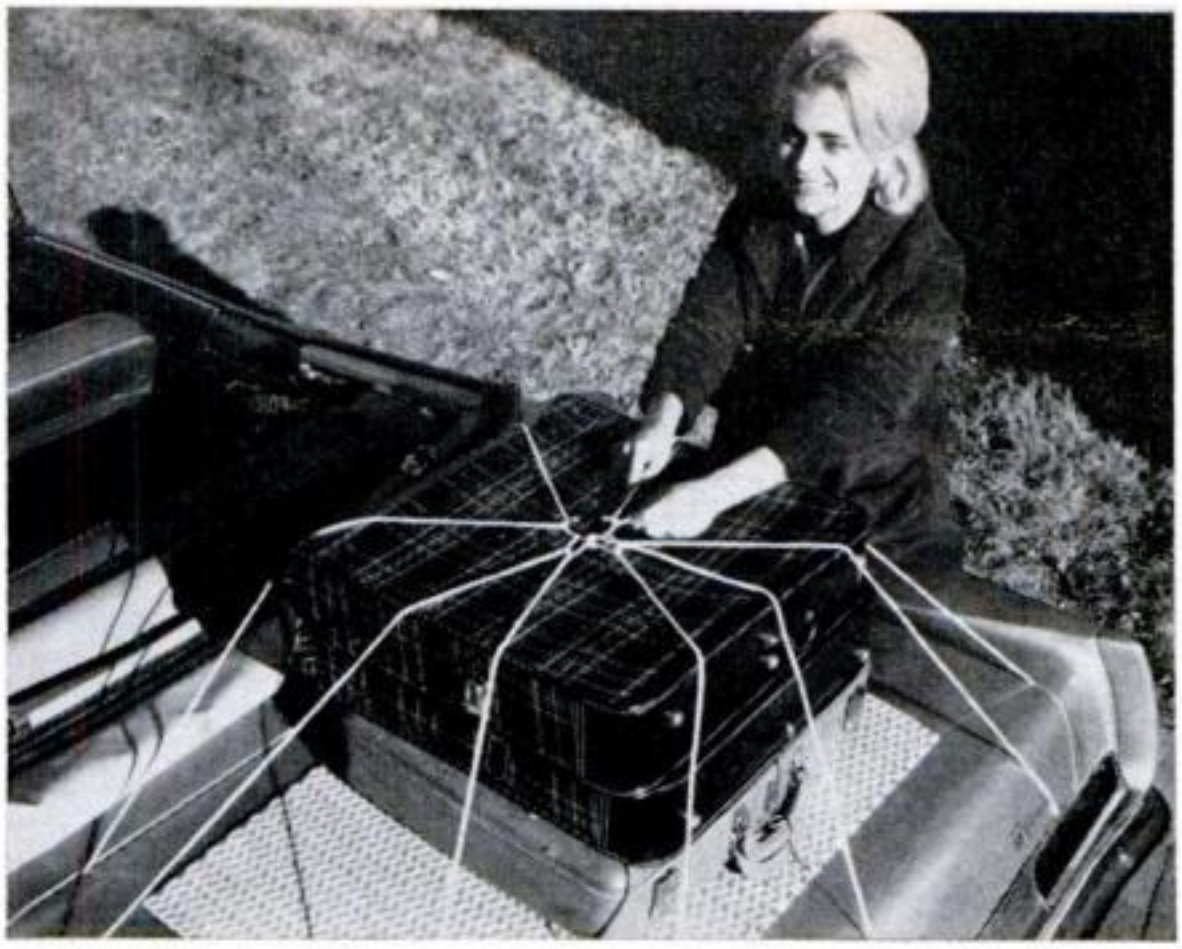
A liquid-fuel Titan III rocket is assembled vertically on the transporter, moved to another building where two solid motors are strapped to its core for added thrust, finally goes to the launch area to be fired off the same stand.

GI dressed for Arctic cold

Scanning snow-covered terrain from the hatch of an Army reconnaissance vehicle, the soldier at right is set for maneuvers in sub-zero weather in far-north Alaska.

The mask is a necessary part of his cold-weather equipment. Without it, biting winds in the extreme Arctic temperature would seriously injure, and perhaps even destroy, the skin tissues of his face.

Urheberrechtlich geschütztes Material



what's new for your CAR

Four-way clamp for excess baggage

Now you can take that extra suitcase with you, even if you don't have a luggage rack. Put the case on the trunk lid and tie it on with polyethylene ski rope hooked into the four-prong Tie-Ton. It's $1.49, with rope. Pella United Sales, Pella, Iowa.

Spray-on for battery prevents corrosion

Rusted battery carriers and messy terminals may be a thing of the past with Noco spray—a combination of anti-corrosive chemicals. Each can holds six ounces, and is available as package deal with the purchase of Noco battery-terminal protectors.

Cover turns pickup truck into an instant camper

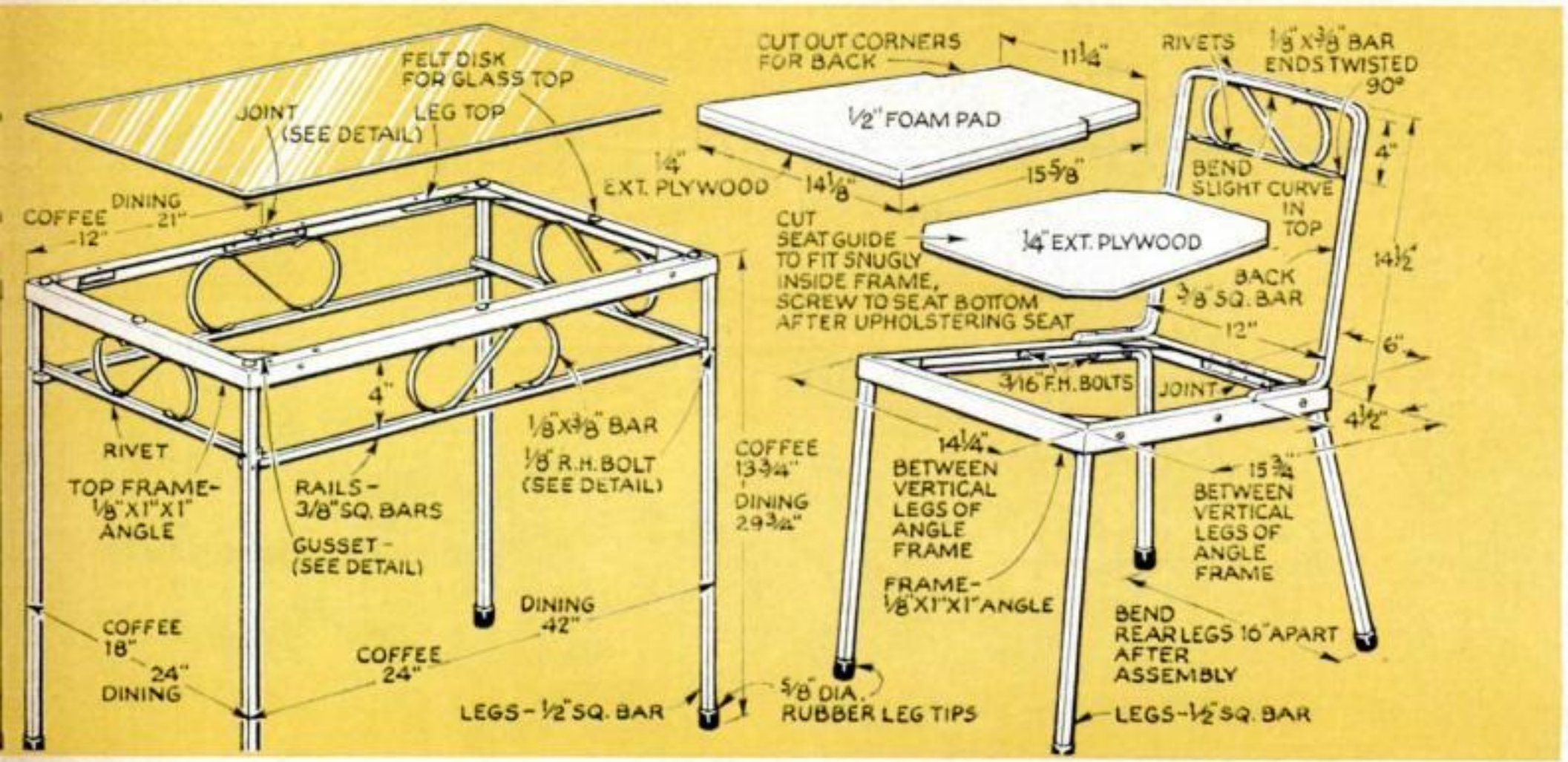
A convertible top for Chevrolet, GMC, Ford, and Dodge pickup trucks covers the entire bed at a height of about 45 inches, turning the truck into a covered cargo carrier or a basic camper. It folds completely away when not in use. Cost: about $160. White Automotive Corp., Colorado Springs, Colo.

Emergency sign prevents chain crashes

Advance warning that your car is stalled can prevent chain-reaction accidents. This 32-by-36-inch sign can be seen a quarter-mile away. It rolls up when not in use, glows in the dark. Cost: $2.98, postpaid, from Unisonics, Yonkers, N.Y.

Urheberrechtlich geschütztes Material

Comfort, simple construction, handsome design are features of this weldless patio set.



Urheberrechtlich geschütztes Material

YOU Can Make Wrought-Iron Furniture

The job's easier if you skip the usual welding and use small bolts and rivets instead

By Phil McCafferty

YOU don't need a welding outfit to make this sturdy and attractive set of wrought-iron patio furniture. All it takes is a fistful of small bolts and rivets. These dependable fasteners are inexpensive, and easy to come by and use. They produce strong bonds. And the threaded connections let you disassemble the outdoor furniture for compact winter storage.

Compare these advantages with welded joints, which call for tedious wire-brushing of all areas to be joined, then awkward clamping of the parts, finally a considerable amount of post-assembly grinding. All this is fine for big industry—but it's not much fun in your home shop.

You may want to change the design or dimensions of the pieces of furniture shown in the drawings below. But you'd do well to stay with their basic construction features. These are simple wrinkles that will save you time and trouble, not only when you're cutting, drilling, and assembling parts, but in shopping for materials.

Of course if you do have access to a welder, there's no reason you shouldn't use it to build the set of furniture. Welded joints always are more durable.

The components. Note the use of a conservative number of shapes and sizes of metal stock. They are: ⅜" and ½" square bar, ¾"-by-¾" and 1"-by-1" angle (both ⅛" thick), ⅛"-by-⅜" flat strip, and 12-gauge sheet metal (for the 3"-by-3" frame gus-

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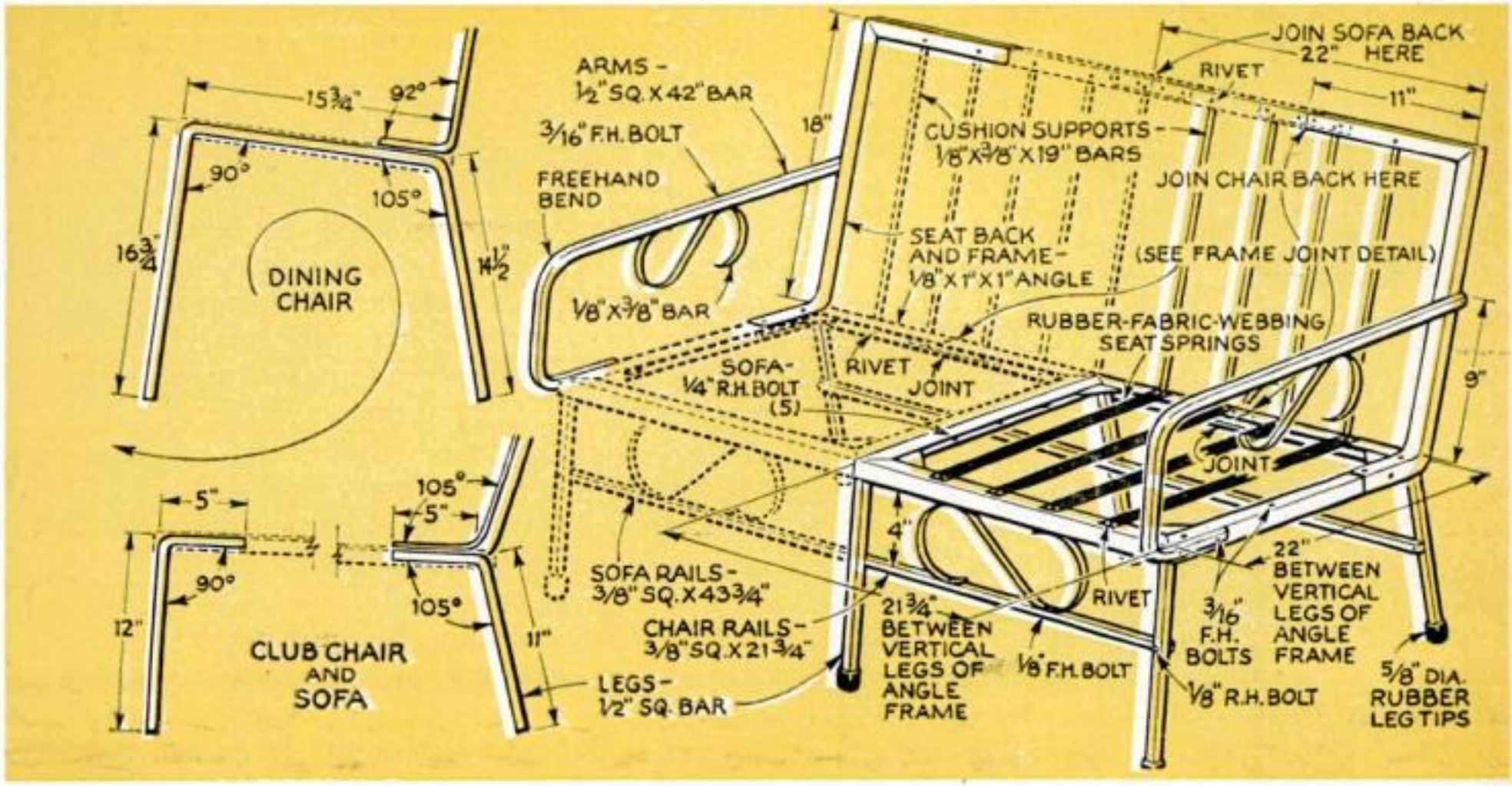
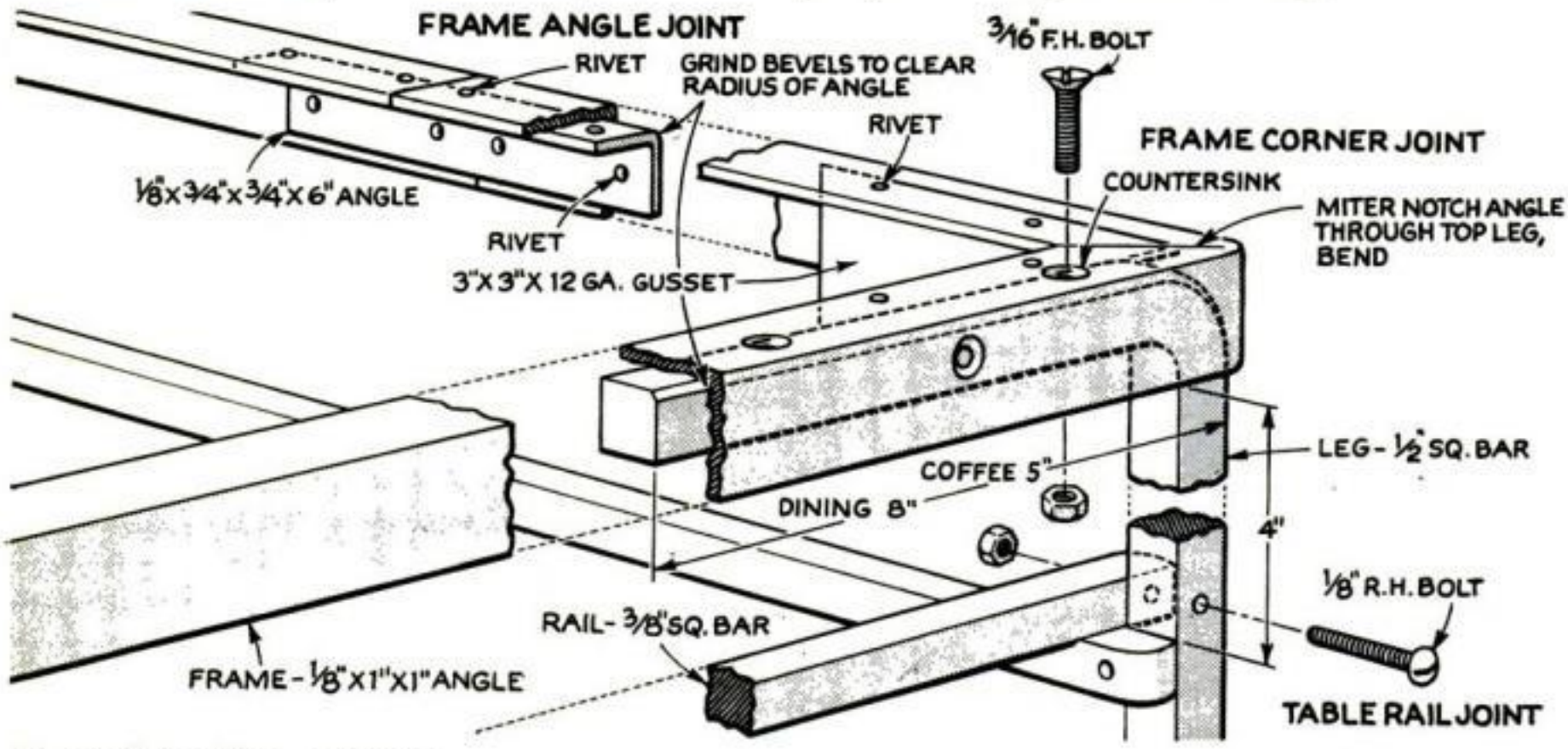
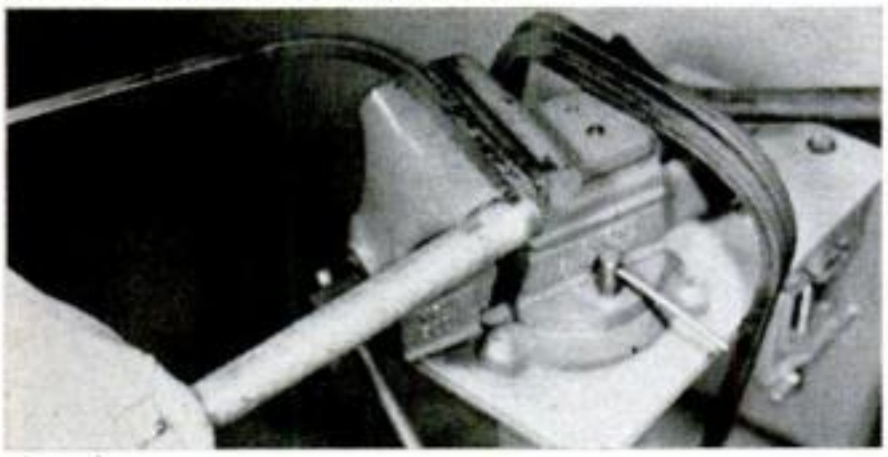


Urheberrechtlich geschütztes Material

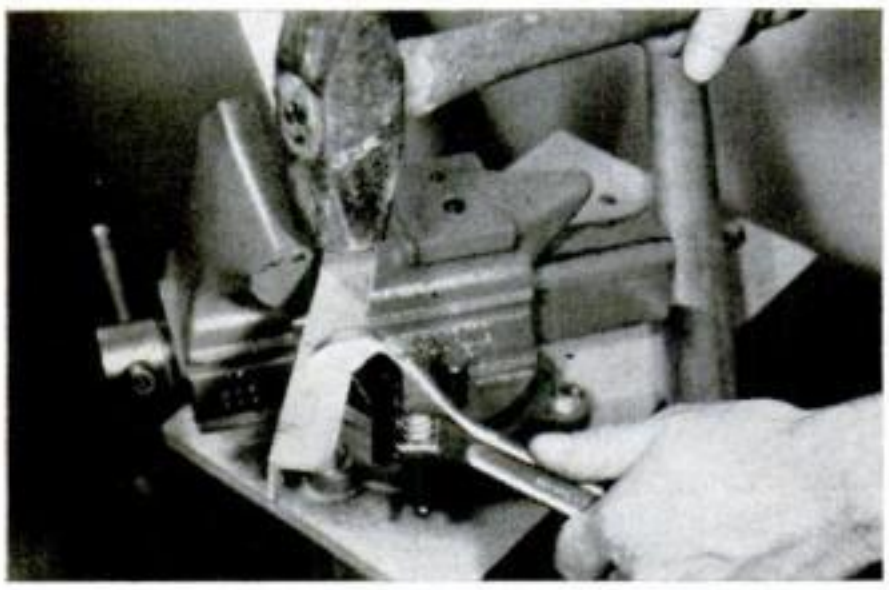
Standardized joints and splices simplify sawing and drilling



Forming the curves

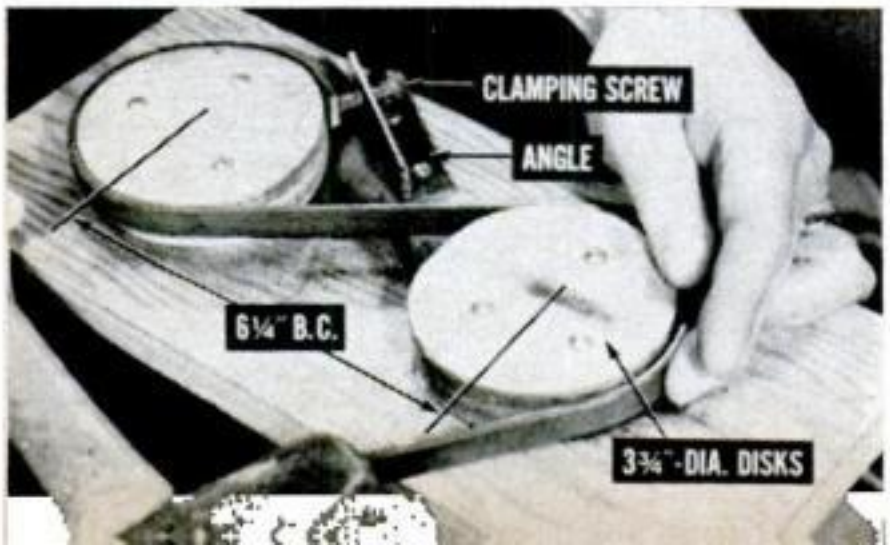


For sharp angles, slip ½" or ¾" pipe over ⅜" or ½" bar stock, respectively. Then lever the pipe, with its end butting against the vise.



When back-bending 1" angle iron with 1¼" pipe, use a hammer and wrench now and then to control the metal's tendency to twist.

Nineteen scrolls cut from 21½" lengths of ⅛"-by-⅜" bar were shaped on a plywood jig, as shown. Hammer the free end to contour.



sets). Technically, none of this material is wrought iron; it's hot-rolled steel.

All but the 12-gauge stuff is available in 4′ lengths at most large hardware stores. Failing there—and for a sheet-metal source if you can't latch onto scrap—consult your phone directory for the address of an ornamental iron shop or a steel-supply firm or warehouse. There's a slight saving when you buy from such outfits. Also, they offer angle stock in lengths that make it unnecessary to splice the table sides and sofa frame and back.

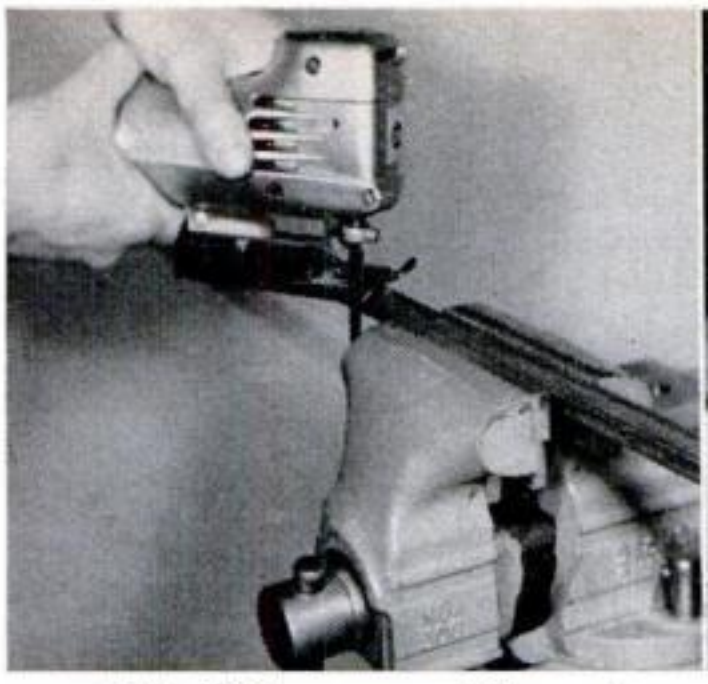
The joints. Follow the sound practice of standardizing all joints and splices. That way, you can use a few simple jigs to spot saw notches and holes for bolts and rivets. (In buying bolts and rivets, stay away from nonferrous metals, which may be quickly destroyed by electrolytic action; either ⅛"-solid-shank iron or Pop rivets are good choices.)

Design and materials. Both for eye appeal and ease of construction, keep a strong family resemblance between the furniture pieces. All scrolls, for example, should be identical. The coffee table is a reduced version of the dining table, and the sofa is simply an elongated chair.

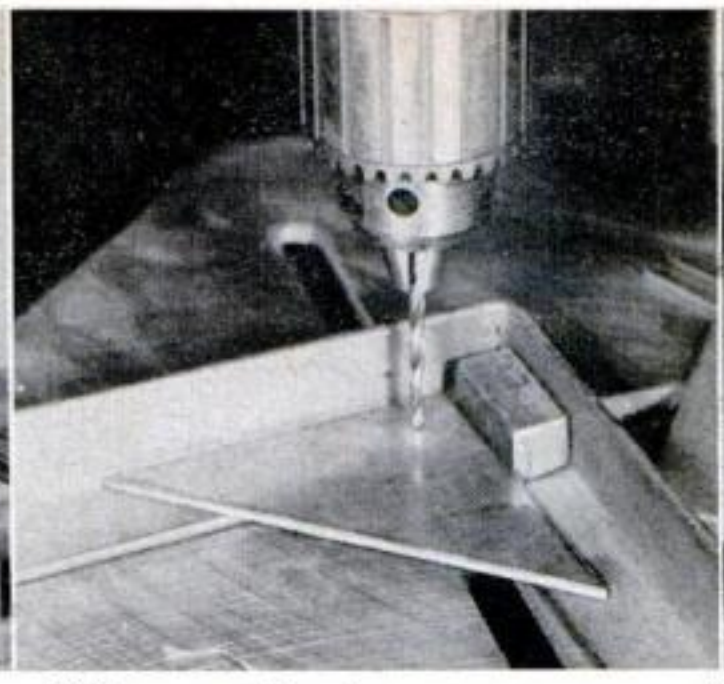
Before dimensioning the chair and sofa frames, check with a local source of foam cushions or a mail-order house to insure a trim fit for commercially available sizes. It's a good idea to buy the yard goods and rubber-fabric webbing and end clips at the same time.

Select a table-top material best suited

Urheberrechtlich geschütztes Material



Cut 90-degree notches where angle iron for legs must be bent to slip inside furniture frames and butt against them. Only exceptions are 80-degree notches for rear chair-leg bends.



When positioning corner gussets to drill holes for rivets, allow space on one side for the chair- or table-leg section that must be flush against frame. Use a scrap of square bar as a gauge.

After assembly of each furniture piece, go back and snug up all bolts. If legs are drawn slightly out of alignment, bend them into position again, and be sure the bolts are tight.

to your needs. The tops shown here were cut and dubbed from 5/16" textured glass. But if you have small children around, you might, for safety, do better with redwood strips, or perforated or expanded metal.

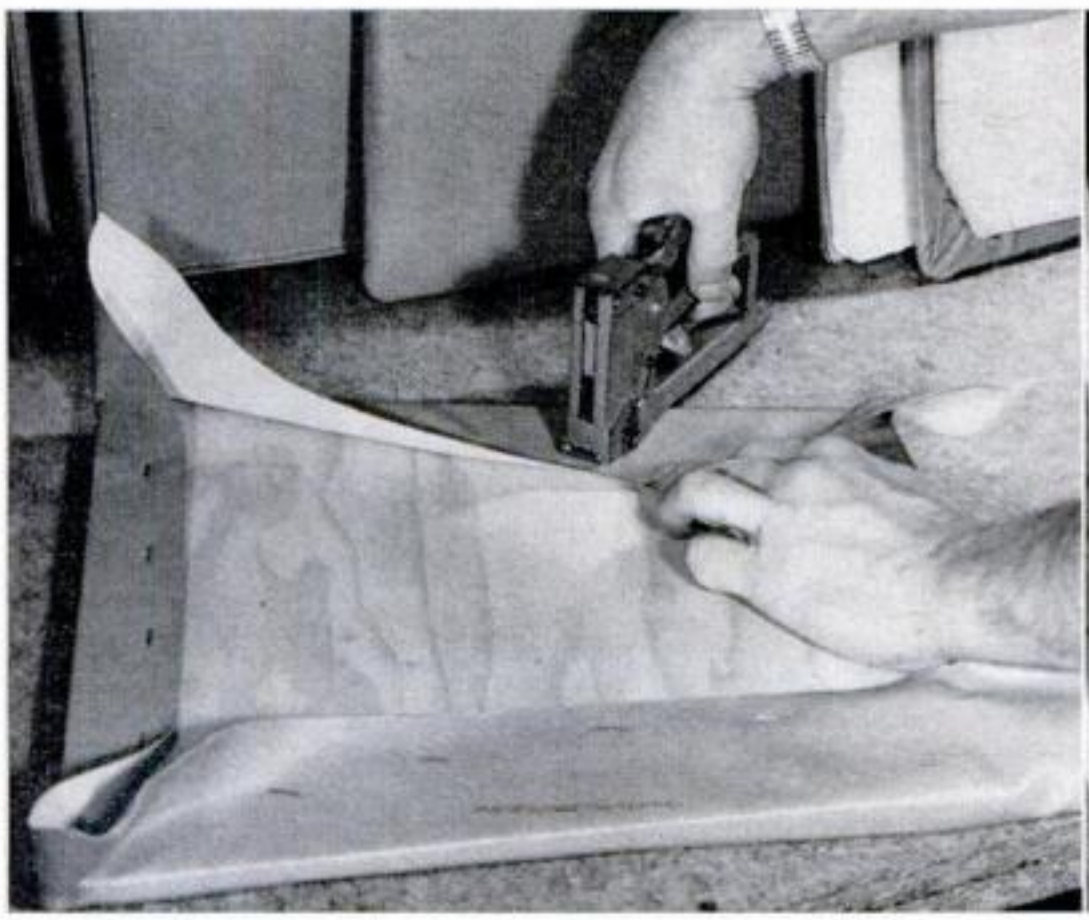
How-to-do-it tips. If you hacksaw the metal parts to size, the best way to insure square end cuts is to saw across the faces independently to a common meeting point.

For appearance and fit, grind or file down bulges that form where square stock is bent.

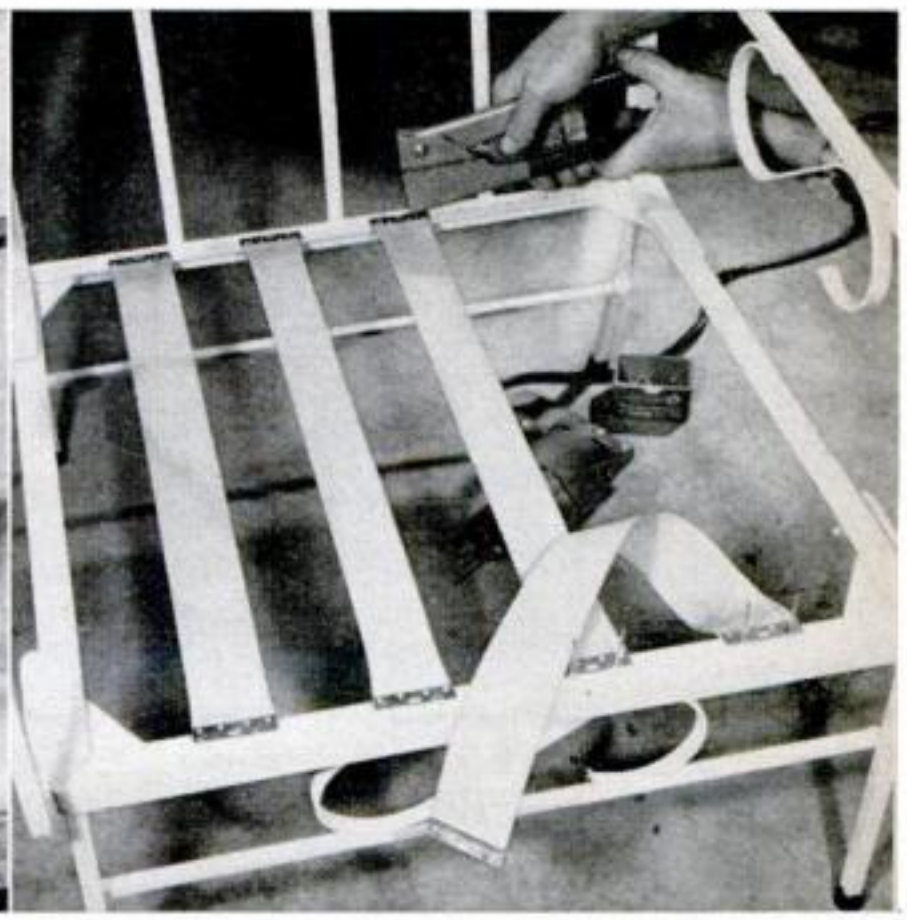
Bore holes for 1/8"-shank rivets with a No. 30 drill. If you use rivets that call for peening, easy does it. Tap lightly around the edges of the projecting metal, gradually spreading them outward and downward to form neat circles.

Finally, remove all mill scale and loose rust from the steel parts for a firm paint bond. A wire brush chucked in an electric drill is best for this. As a further precaution, give the members a hosing with hot water, and apply a coat of rust-inhibiting primer before finishing with exterior enamel.

In use, remember that any light metal furniture of this type is easily damaged by abusive treatment. ■■



Foam padding is pinned to plywood seat form with just enough staples to hold it in alignment. Then vinyl fabric is drawn firmly over it and stapled to the bottom of the form.

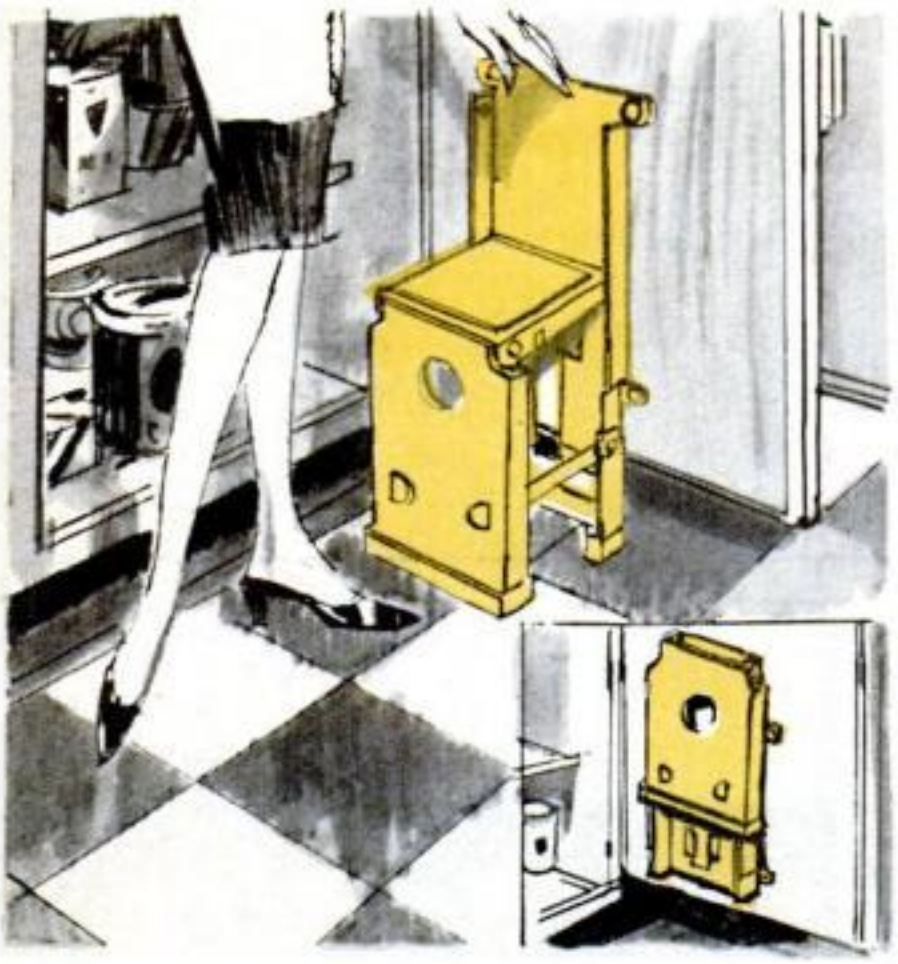


Apply rubber-fabric webbing to chair and sofa frames after the furniture has been painted. Cut lengths about 1" short, attach to end clips, and rivet the clips to the angle iron.

Urheberrechtlich geschütztes Material

New Ideas from the Inventors

Dockside launcher starts skier. Even a beginner could quickly set himself—and his skis—in proper planing position with the help of this recently patented launcher. Mounted on a dock, the angled seat and ski platform could be adjusted to a skier's height and the water level. A hinge at the rear would line it up with a moving tow boat.

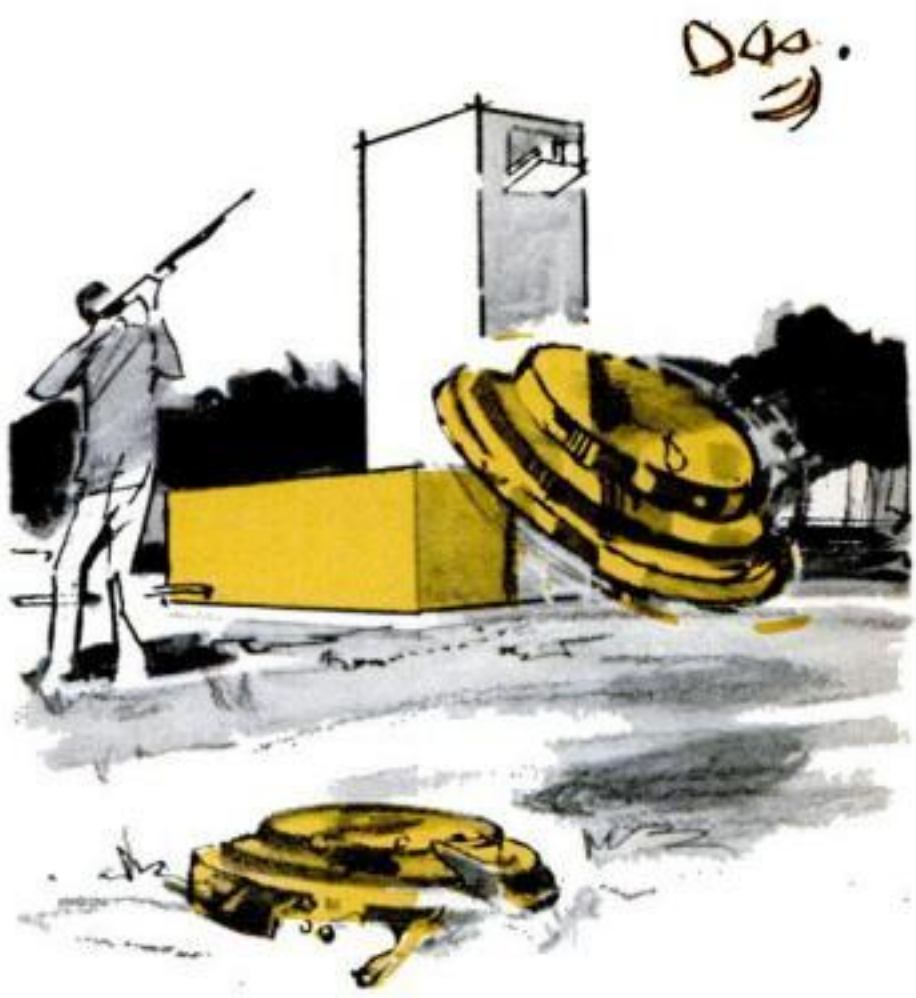


Cabinet holds kitchen ladder. You'd be able to reach upper kitchen cabinets more easily if you had a ladder like this one mounted inside the door of each lower cabinet. The compact, sheet-metal step would fold flat against the door for in-the-cabinet storage, or unfold onto its own let-down legs to support a climber's weight.

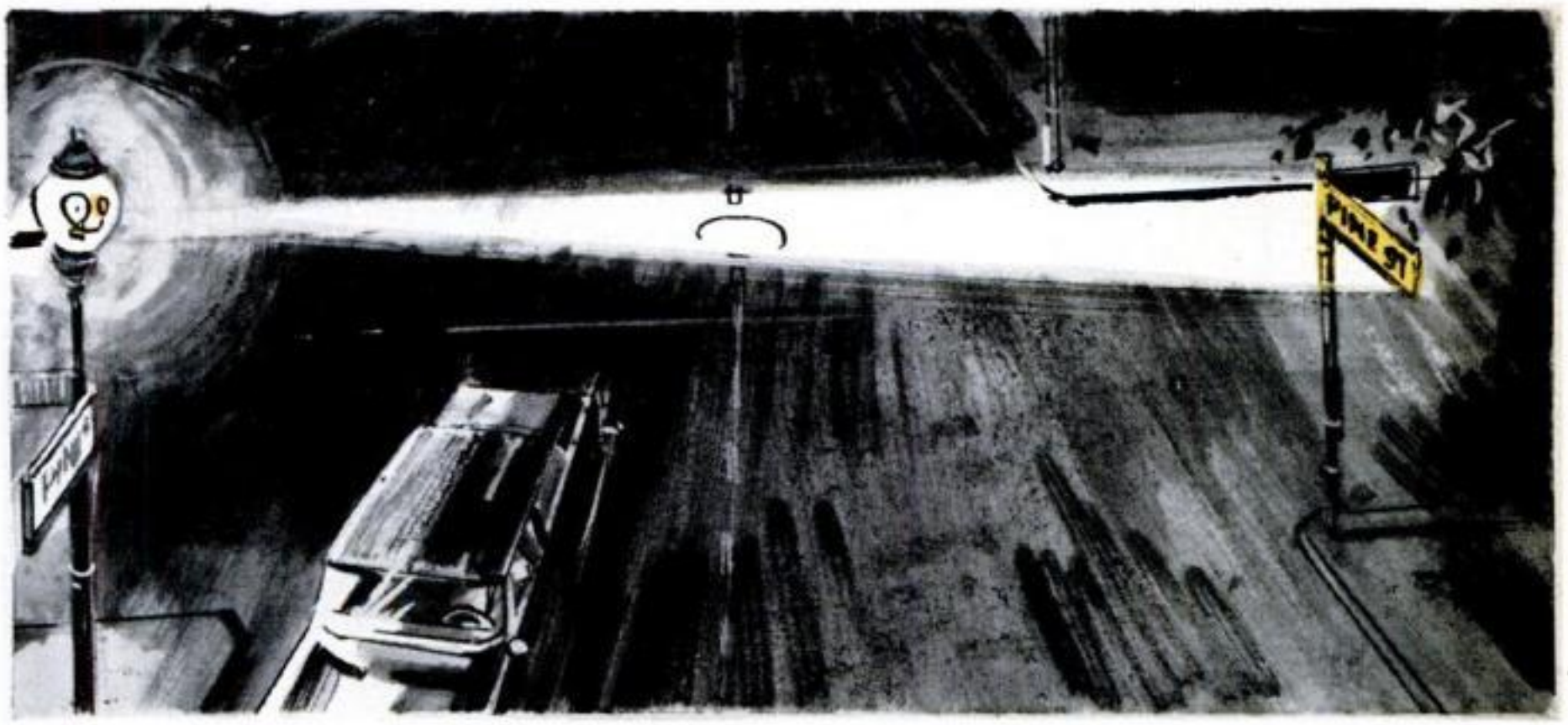
Haul-back line moors boat. With this system—a double reel with the line running through an anchor eye and attached to the boat—you could anchor safely offshore and continue on to the beach for offloading. There, you'd plant the reel in the ground and winch the boat out to deep water. To reboard, you'd winch the boat back to shore.

Urheberrechtlich geschütztes Material

Heated rim prevents glass fogging. Eyeglass steaming caused by the condensation of warm air on cold lenses (or by the moisture exhaled by masked surgeons or dentists) might be avoided by piercing lens edges, to promote air circulation, and heating the frames electrically. Batteries in the earpieces would power the heaters.



Ice targets keep range clean. Targets for trap shooters would just melt away, eliminating the clean-up nuisance, if they were molded from ice. This refrigerator would freeze and store the low-cost targets, then feed them to a conventional target thrower. Colored water could be used for better visibility or target identification.



Lens improves sign lighting. To make dimly lit street markers and warning signs more visible without adding to a town's electric bill, this inventor suggests gooseneck-mounted lenses inside the globes of street lamps. The lenses could focus light onto one or more nearby signs without reducing general illumination in the area.

The following patents have been issued on these inventions: **Ski launcher**—*No. 3,095,845 to W. O. Dawson, Exeter, and R. K. Fraser, Amherst, N.H.;* **Kitchen ladder**—*No. 3,136,386 to J. Horvath and W. Jung, Morton Grove, Ill.;* **Haul-back line**—*No. 3,063,402 to V. P. Vallquist, Seattle;* **Heated glasses**—*No. 3,160,735 to G. Aufricht, NYC;* **Target freezer**—*No. 3,159,011 to J. Kaluzny, Orchard Park, N.Y.;* **Lamp lens**—*No. 3,161, 356 to W. Brenner, Levittown, N.Y.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington, D.C. 20231, at 25 cents each. To write to an inventor, if the address above is insufficient, address him (by name and patent number) in care of the Commissioner of Patents.

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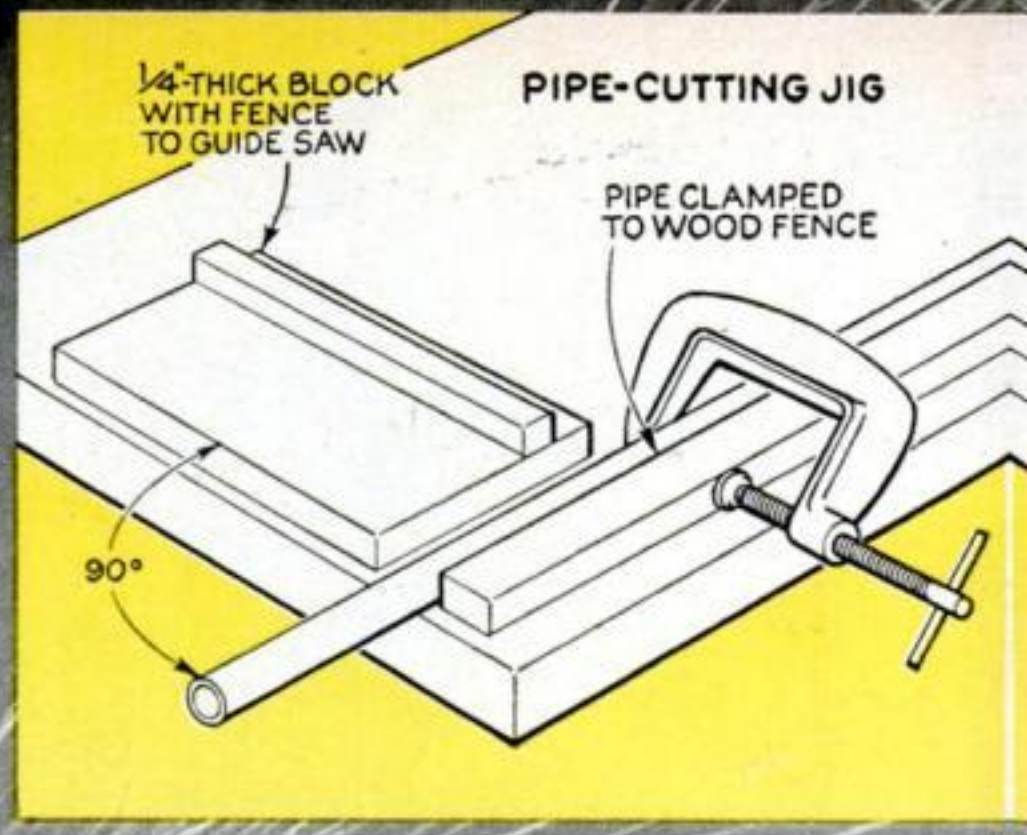
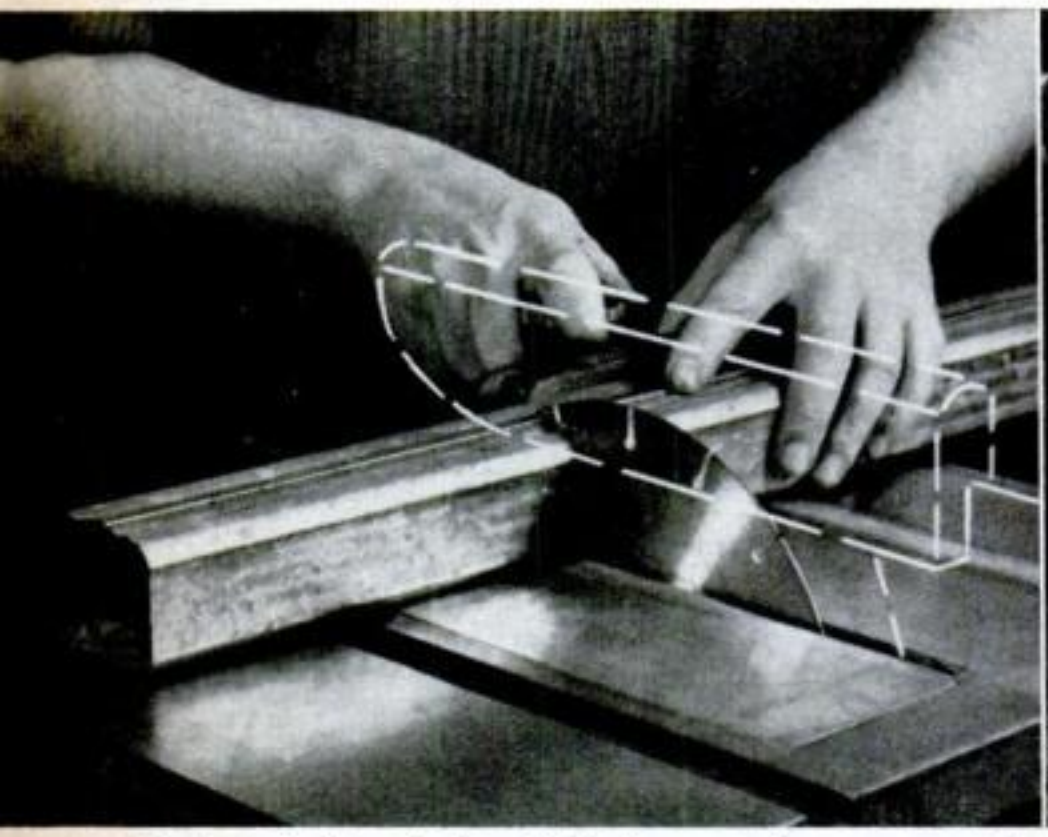
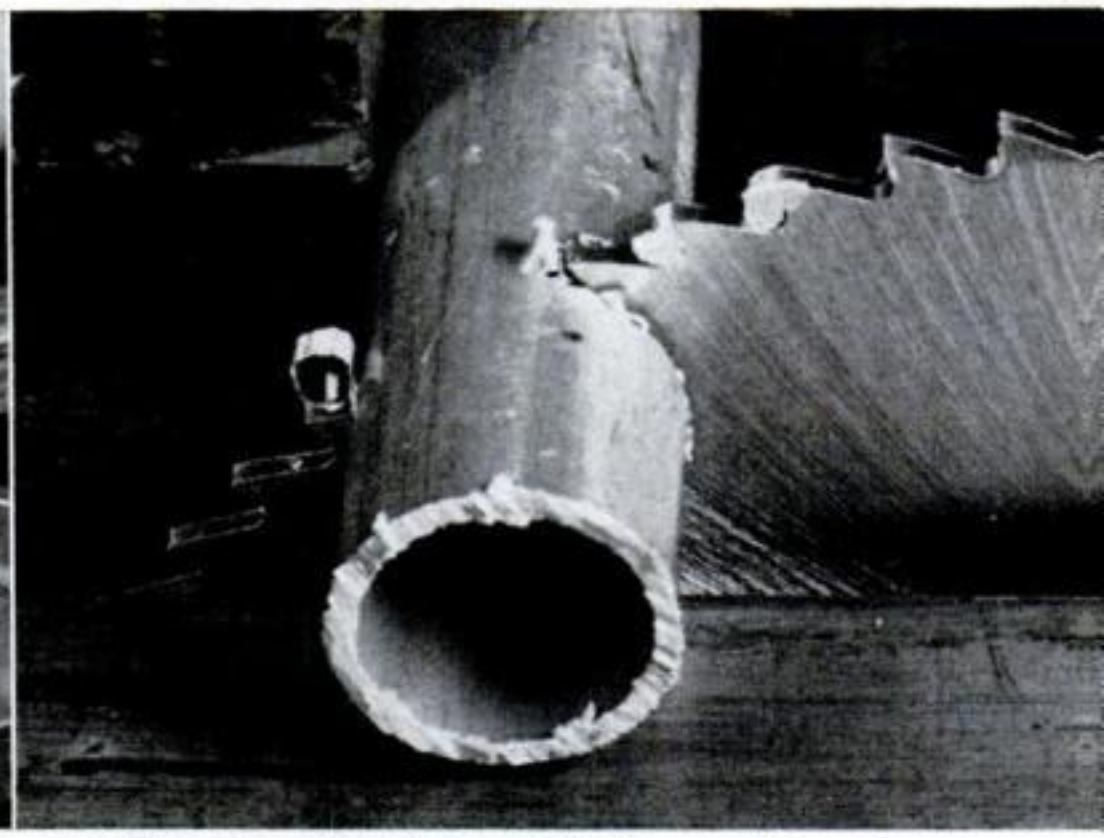


With a wood guide for the saw, and the work clamped to a wood-strip fence, an abrasive disk on a portable saw quickly slices 1" pipe squarely to length. Always wear goggles for such work, and don't let others stand in front of the line of cut. Though cutoff disks must be used with caution, they are great labor-savers. But they should be used to cut iron and steel only.

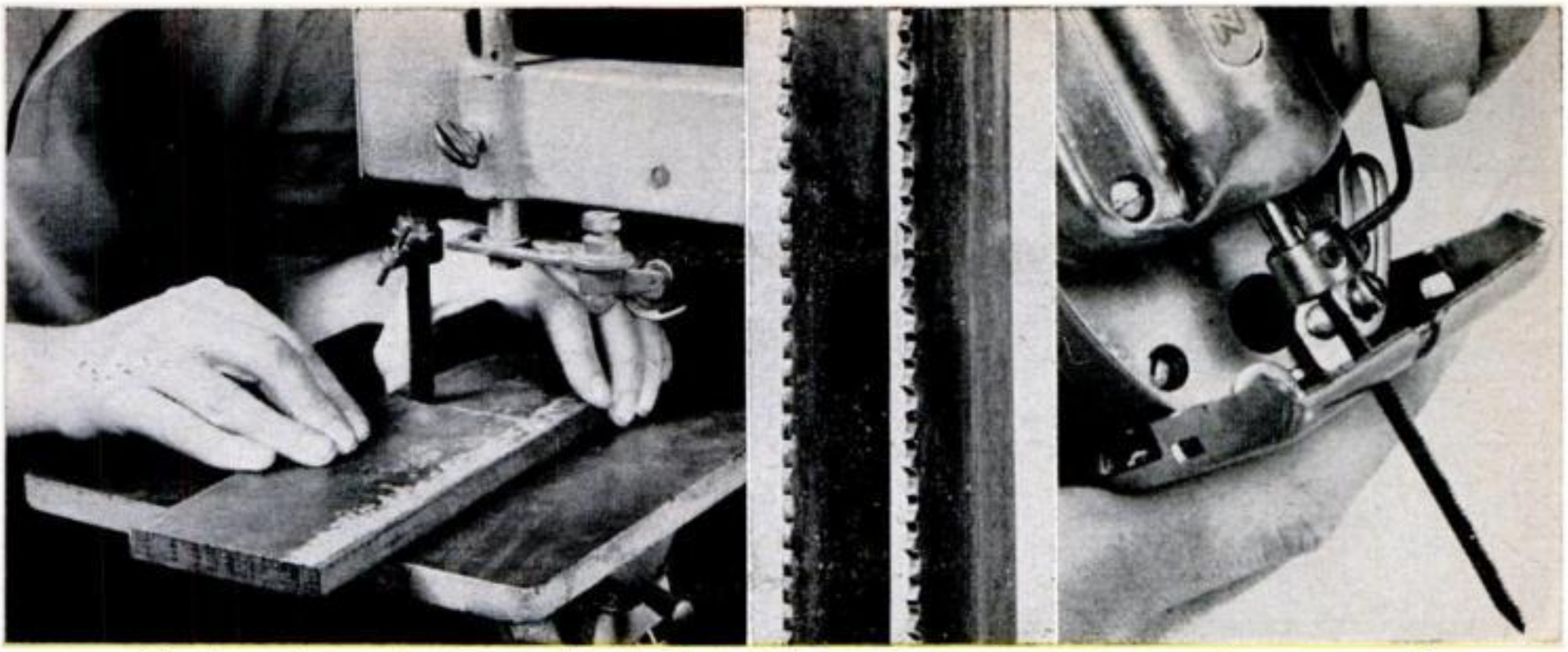


A slotted "steel-slicer" blade cuts ferrous metal by friction. *Keep the blade guard on* (it's removed here to show the blade). Similar bandsaw blades will cut thicker steel.



Metal-cutting circular-saw blades can slice aluminum and other soft nonferrous metals. If chip-loaded teeth leave a rough cut as above, apply beeswax or grease stick to them.

Urheberrechtlich geschütztes Material



Chuck a piece of tungsten-alloy hacksaw blade in a jigsaw, and you can cut mild steel ⅛" thick. Such top-quality blades far outperform carbon-steel blades, as proven above. The carbon-steel blade at left cut less than 1" of ½" steel before its teeth stripped. Tungsten-alloy blade to right of it, though dull after cutting 12" of this stock, is still usable. Hold work down firmly on the table with both hands. Discard blades that are dull enough to bind repeatedly in the kerf.

Your saber saw will cut curves in light metal if fitted with a 32-tooth-per-inch tungsten blade. It may be ground narrower along its full length to negotiate turns better. Support the work on a notched board.

How to Cut Metal with Woodworking Power Tools

You can use them to slice iron pipe, aluminum tubing, or steel gutter with speed and ease

By John Burroughs

WHEN you have to cut metal, don't overlook home power tools. Though designed to cut wood, some of them will slice steel and anything softer. All it takes to save yourself laborious hand hacksawing or snipping is the right blade or abrasive wheel, a pair of goggles, and common sense.

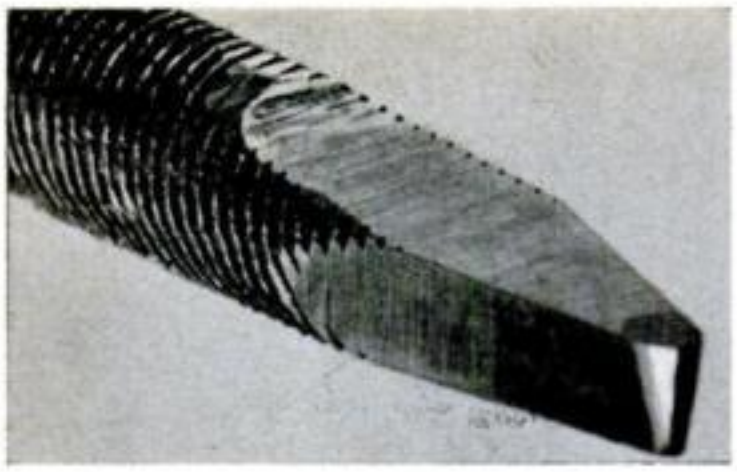
Bench and radial saws will do a fine job of cutting soft nonferrous metals. Simply mount a small-toothed, taper-ground blade made for this purpose, put back the blade guard, and you're ready to saw soft aluminum, copper, and brass. But do it safely.

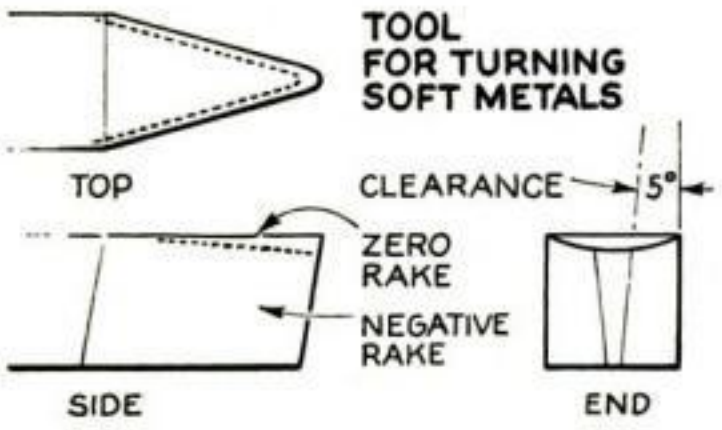
Always wear protective goggles. Never try to cut hard aluminum alloys or sheet steel with a circular saw. These chrome-alloy blades *must* be kept sharp; once dull, the teeth heat up and soon burn. Touch them up with a file before that happens. On a table saw, you can improve their cutting action—and keep them sharp longer—by slowing down the saw arbor. Either rig a step-pulley drive on which you can shift the belt, or substitute a 1,750-r.p.m. motor for the usual 3,450-r.p.m. one.

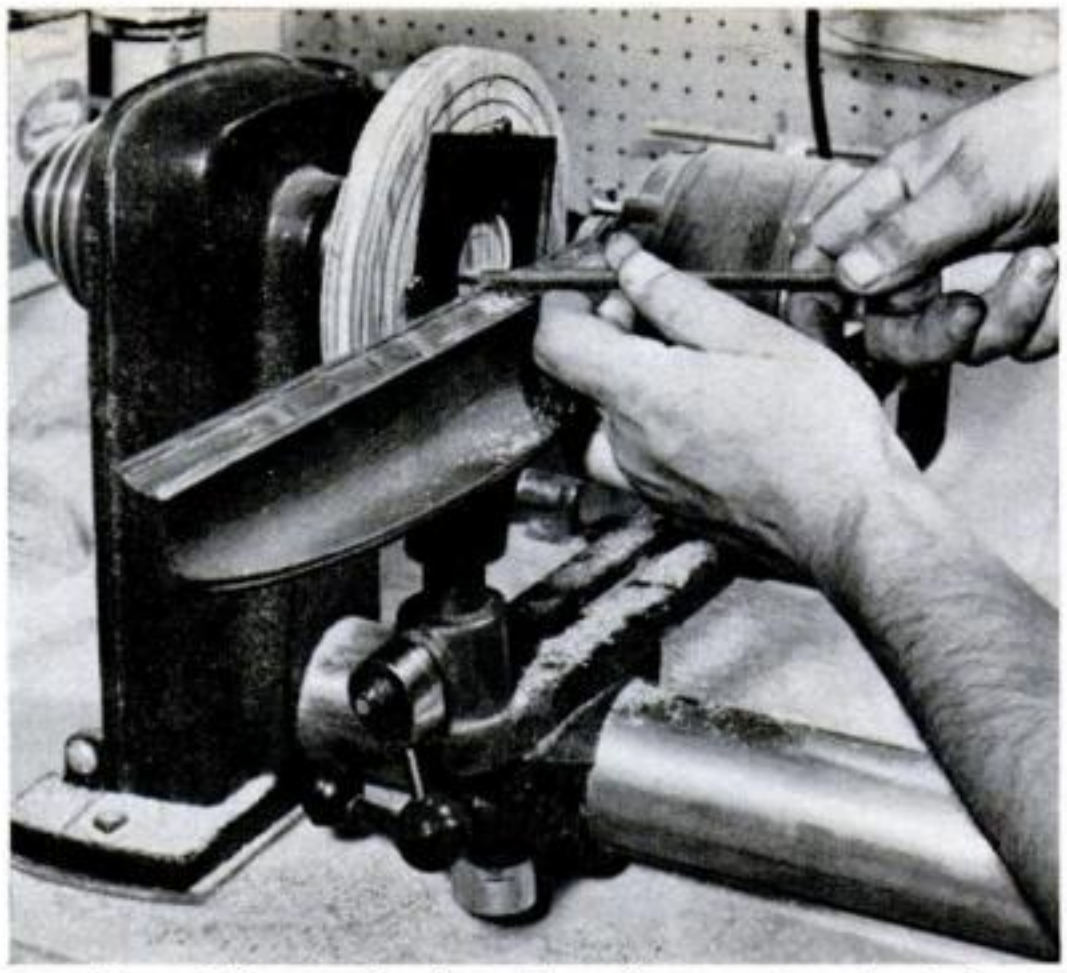
Don't be tempted to mount an abrasive cutoff wheel on a table or radial-arm saw at any time. These bonded-grit disks, even when reinforced with fiberglass, are brittle and apt to shatter, with possibly disastrous results.

You can cut steel on a table saw with a

Urheberrechtlich geschütztes Material







Soft metals can be turned in wood lathes with hand-held tools. These may be ground from old round or square files, as above. At right, a die-cast camera lensboard is fastened to a plywood disk on the faceplate for turning the hole to size. Set tool rest close to the work at a level that brings the tool edge to center height. Run the lathe at medium speed for this job.

friction-cutting blade. These edge-slotted alloy-steel disks can also be used on radial and portable saws. They're wonderful for cutting corrugated roofing, downspout, gutter, and ducting, or other stuff made of thin black or galvanized steel up to 3/32" thick. Don't try to use friction-cutting disks on nonferrous metals.

When steel is held against such a blade with constant pressure, the metal spot-heats at the point of contact and rapidly burns and wears away. Since any part of the blade is only momentarily in contact, the blade itself stays cool.

Take care to avoid twisting the work out of line with the blade. Should the disk bind in the kerf, the sheet being cut could kick back and cut your hands. Wear heavy gloves to handle awkward pieces.

Special bandsaw blades for friction-cutting thicker steel are available at machinist's supply houses. One of these can snick a big file apart in no time.

Portable electric saws. These can be used with a metal-cutting blade to slice nonferrous metals, a friction-cutting blade to chop gutters and downspouts to length, or an abrasive cutoff wheel to cut steel angle or channel up to 1/8" thick, as well as pipe up to the nominal 1" size.

Abrasive cutoff disks offer the fastest way to cut iron and steel. Usually 3/32" thick, these disks are made of resin-bonded aluminum oxide grit reinforced with fiberglass. They are not meant for nonferrous metals.

Use a cutoff disk only with the saw guard in place. Stand to one side of the line of cut. Be sure to wear goggles. As the disk is sure to shatter if twisted in the kerf, feed work squarely—against a guide if possible. Remember that the steel gets red-hot at the cutting point, and sparks could ignite sawdust or debris.

Power hacksawing. Your saber saw will cut curlicues in thin sheet metal or jog its way through copper pipe. Use fine-toothed metal-cutting saber blades or grind a good hacksaw blade to fit the chuck.

A piece of tungsten-alloy hacksaw blade in a jigsaw can cut 1/2"-thick steel plate. Break the blade into 5" lengths and grind its ends to fit the jigsaw chucks. Use an 18-tooth-per-inch raker-set blade for medium to heavy cutting, a 32 t.p.i. wave-set blade for thin stock.

Turning metal on wood lathes. Small brass, aluminum, and die-cast parts can be turned with a hand-held tool. Some work can be mounted between centers and driven from the faceplate. Other pieces might be bolted directly to the faceplate.

An old file can be ground to make a turning tool. For a better one, braze a 3/16" square metal-turning lathe bit to a steel shank and drive on a file handle. ■ ■

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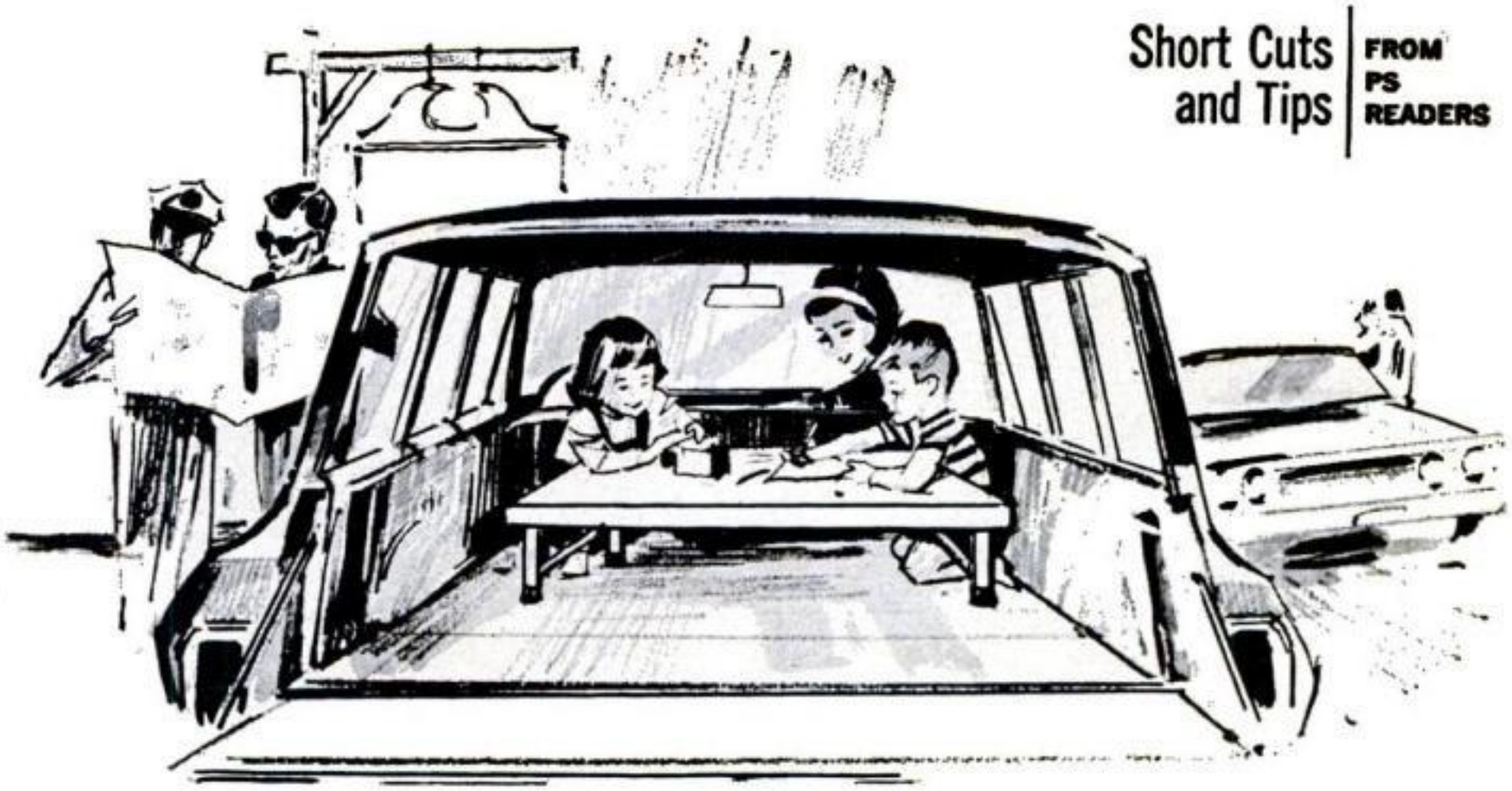
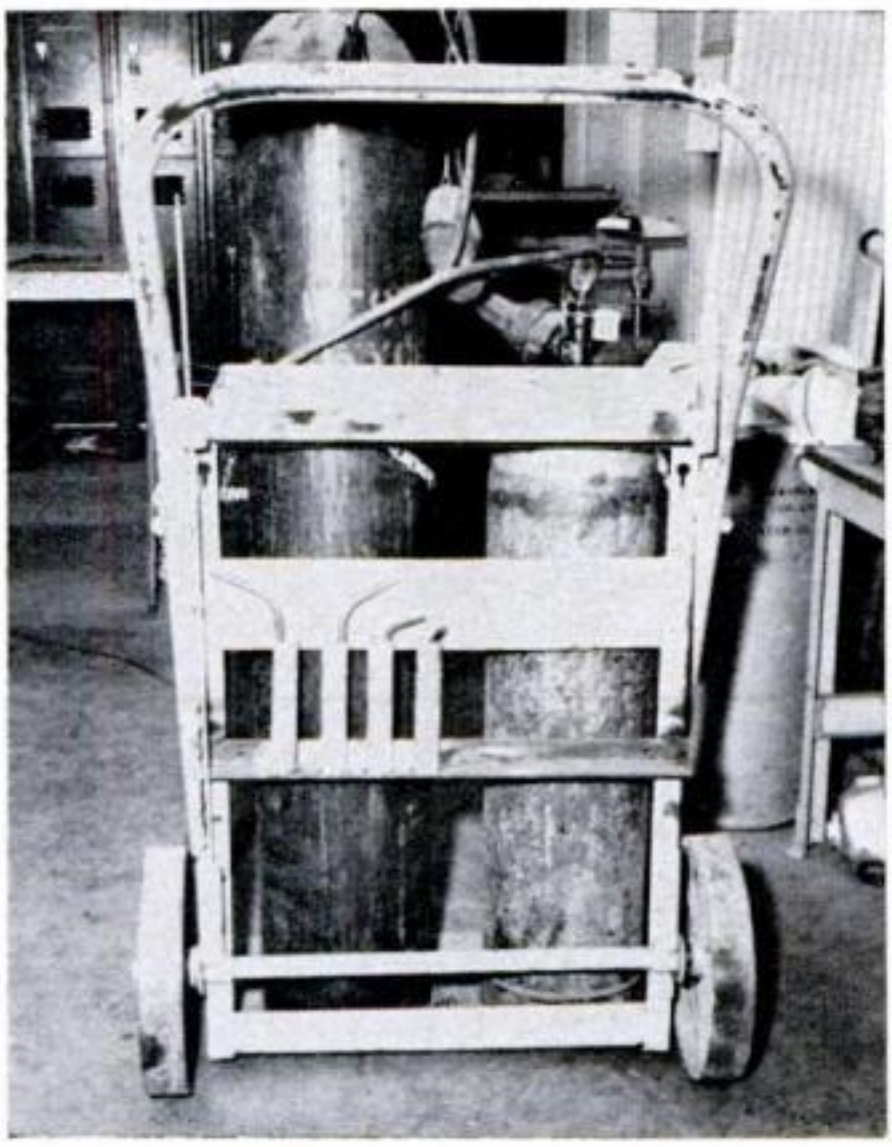


Old card table useful in station wagon

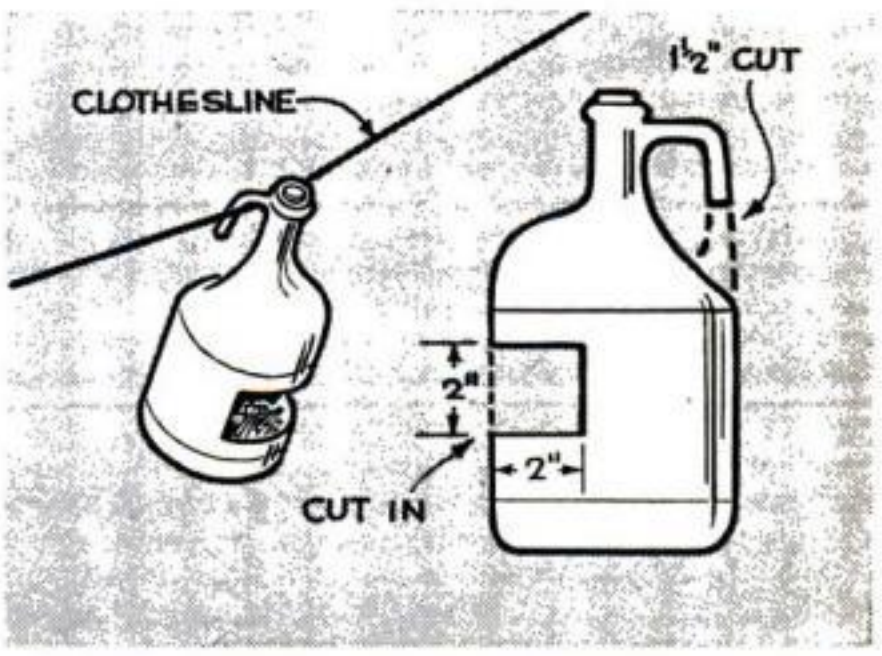
A folding table is ideal for children in a station wagon while traveling. The one shown is an old card table with its legs cut down to 9" and crutch tips on them. This height is fine for using crayons or playing games. Adults in the front seat also can rest beverages and food on the table.—*Robert Bostrom, Minneapolis.*



Keeping spare welding tips at hand

Welding tips are kept handy and their openings are guarded against damage through contact with metal objects if you store them inside pipe nipples welded to an angle-iron brace on the back of a welding cart.—*Stan Clark, East Bradenton, Fla.*

▶▶▶Anyone who has ever glued two pieces of wood together knows how difficult it is to keep one piece aligned when there's slippery glue under it. My solution: Drive nails through one piece, just far enough so that their points penetrate the other piece. Lift off, put on the glue, and replace. The piece won't slide around.—*Carl A. Rathje, Wyomissing, Pa.*



Washday use for plastic bleach bottle

Empty plastic Clorox bottles have been put to many uses since they were introduced a few years ago, but none more ingenious, I think, than this clothespin holder. Put a cut in the handle, a hole in the side.—*G. I. Wilson, Salt Lake City.*

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PS TOOLS

You Can Rent

Any job becomes easier with the right tools. If you don't own them—here's a solution

By George Daniels

YOU need never again do a job the hard way just because you lack some expensive special tool that would make things easy. You can rent any tool you need at a small fraction of its purchase price, and thus get to use tools you might never buy because you need them so seldom. The roof-high extension ladder, a once-in-a-while tool, is yours for $1 a day. A 10-wheel crane, probably a once-in-a-lifetime tool, rents for about $8 an hour.

Surveys indicate that about one out of every five of us has learned the facts of tool rental. More than half are everyday home owners. Contractors rank second, industry third. Together, these assorted customers have boosted the number of rental stores across the country well into the thousands and sent the annual gross beyond 500 million dollars.

One reason the business is booming: It is tailored to your pocketbook. You can rent a tool not only for a day, week, or month, but for just a few hours, if that's as long as you need it. And you save plenty. Or you can pick up a tool in the evening on your way home from work, keep it overnight, return it on your way to work the next morning (about 15 hours later), and pay the same fee you'd pay for 4½ hours' use during the day. If you're shifting heavy furniture (a refrigerator or

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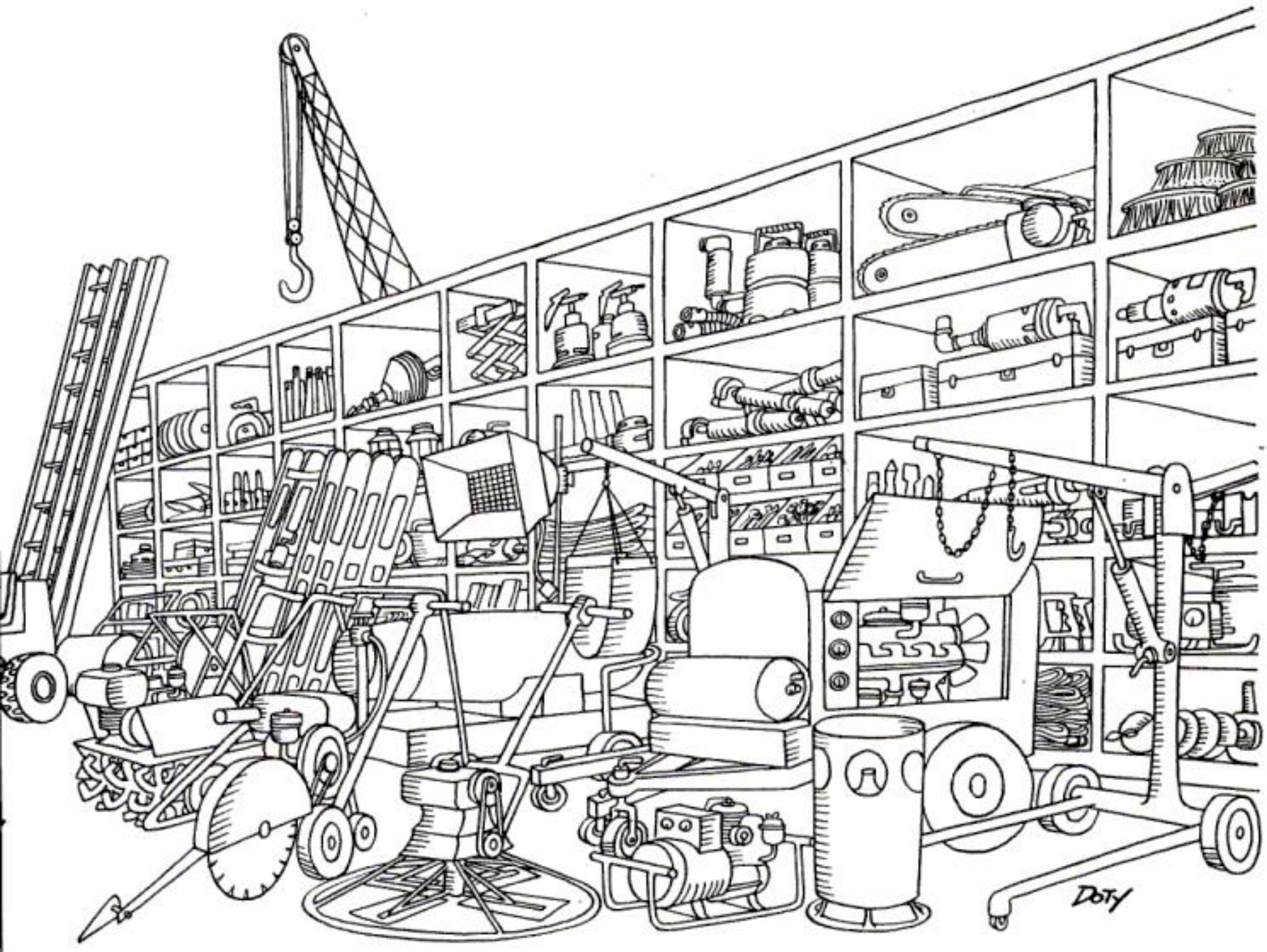

Almost Anything!

freezer), this lets you use a $50 appliance dolly as late as you please to make the job easy (it even rolls up steps) for just about $1.50. You'll also get a bargain rate (it varies with the company) on Saturday-to-Monday rentals.

If you've never used a particular piece of equipment, you can learn all about it at the rental store before you take it home. That's part of the business.

If you're a pro and use a rented tool in your work, the rental fee is tax deductible. You have no worries about depreciation or maintenance. And you have a ready-made excuse for not lending the tool to borrowing neighbors.

Maybe all this explains why a West Coast customer has set one rental chain's record by keeping a $75 adding machine at $10 a month for four years—for a total expenditure that would buy the machine half a dozen times.

To the rescue. What sort of thing might you rent? For answers, let's pile up the kind of problems you might have on one of those days when everything goes wrong.

A violent storm tumbles a big tree across your lawn and floods your cellar. A falling limb cracks a welded section off your iron porch railing and Junior sprains an ankle tripping over it. Downed power lines knock out the current, stopping your refrigerator and freezer. Your wife announces that the sink drain is stopped up. Your daughter phones from school to say she has left her bargain car in a one-hour parking space 10 miles away with a burned-out clutch. And to top things off, your dog is howling in discomfort because his hair's too long.

Where do you go from here? Answer:

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to the rental store for some problem solvers you're not likely to find in your home shop. (You can find the nearest rental outfit in your phone book's yellow pages under "Tools—Rental.")

First, you'll have to drive out and bring back that broken-down car by yourself, with nobody to steer it. So you pick up a $65 tow bar at the rental store for about $3.50 a day. Clamped from your rear bumper to the other car's front bumper, it steers the towed car automatically and saves you a whopping tow bill. It isn't a short-haul gadget, either. Manufacturers often use it for two-at-a-time rush deliveries of trucks and cars for hundreds of miles cross-country.

Back at home. With the car retrieved, you put the electric power back in your house to save the food in your refrigerator and freezer. A $300 gasoline-powered generator does this trick for 24 hours for about a $10 rental fee.

Another $6 or $7 gets you a $250 heavy-duty chain saw for the two or three hours necessary to cut that fallen tree to firewood.

You bail out your flooded cellar at up to 7,000 gallons an hour with a $100 motor-driven pump that rents for about $5 a day.

A $160 arc welder at another $5 a day lets you fix that broken iron railing.

About $10 worth of plumbing tools, including a steel clean-out tape, all for about a $1-a-day total, clear your clogged drain. (Even if your outside sewer line is jammed with roots, you can clear it with a rented tool—a $300 electric Roto-Rooter at around $9 for 3 hours—the usual time required.)

You trim that poor, shaggy dog with a $60 electric animal clipper you can keep for 24 hours for about $3, which allows time for cajoling the dog into sitting still.

That leaves you with Junior's sprained ankle. You can't rent him a temporary ankle. But, as most rental stores have a "sick room department" (as well as a party department), you can rent a pair of $15 crutches at around $1.50 a week to keep him off that foot.

All in all, you have rented $1,260 worth of tools (even including the Roto-Rooter) for about $45. It might easily cost you more than that just to have a man cut up that tree.

Of course, you don't need a calamity to make tool rental worthwhile. If you want to paint your house, about $8 gets you a $200 heavy-duty spray outfit, complete with 2½-gallon tank, for 24 hours—long enough to put two coats on the average house with drying time between. If the house has settled with age and you want to lift the sills for shimming, as little as 50 cents a day ($1 minimum total) gets you a $16 house jack (not just a jack post), and $3 gets you a $75 hydraulic model that can lift 20 tons. If you want to be sure of your property line to fence in that dog, $4 gets you a $300 surveyor's transit for 24 hours.

Workshop tools. If you're planning a shop project like furniture or built-ins and you're short on equipment, you can rent any standard hand or power tool, usually with the exception of a metal-turning lathe. (Rental stores generally skip this one because of the time required to set it up.) Most others rent for a nine-hour day at around 1/10 to 1/50 (or less) of their initial cost. Here are some samples:

Table saw	$4.00
Radial-arm saw	$6.00
Drill press	$3.50
Jointer	$4.50
Portable circular saw	$3.50
Saber saw	$2.50
Power drill	$1.75
Orbital or reciprocal sander	$3.00
Belt sander	$3.00
Disk sander	$2.00
Socket-wrench set (large)	$2.25

You can even rent simple hand tools like hammers, screwdrivers, and planes—usually in groups to make up the $1 minimum rental. For automotive work you can rent just about any tool found in a well-equipped garage, from a transmission jack at around $4 to an engine hoist at around $5.

If the rental store doesn't have exactly what you want, the owner can often suggest a substitute. Such was the case with a well-dressed elderly woman who visited a United Rent-Alls showroom in quest of a washtub. Having no washtub, the owner offered a watertight wheelbarrow and was surprised to find his customer delighted. "Far better than a washtub," she said.

She has been renting the wheelbarrow at intervals ever since. It serves as a rolling bin for ice cubes and mixers at her lawn parties.

Even stranger was the purpose of an independent rental-store customer who rented an air compressor and jack hammer, then asked where he could buy cement blocks to break up with the jack hammer. Not that he didn't like cement blocks. He had found

[*Continued on page 186*]

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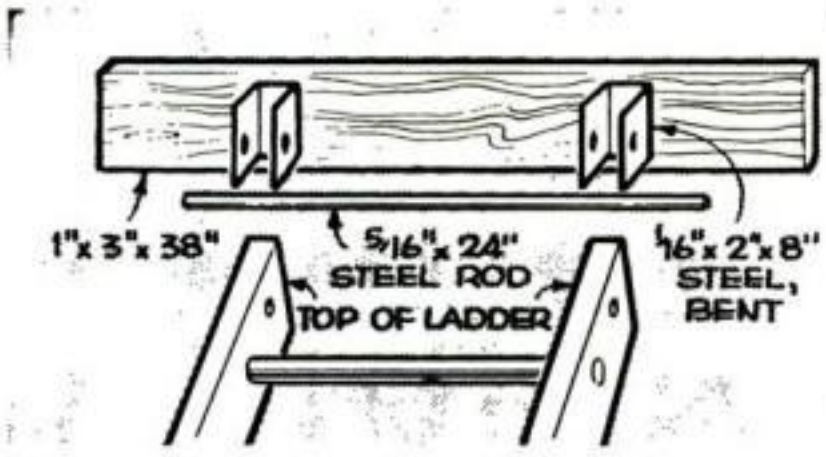
Inner-tube raft totes heavy rocks

When rocks are available along the shore for dock work, beach improvement, or sea walls, you can transport them easily in this raft—a truck-tire inner tube with a double thickness of old canvas across it. I put eight grommets on the edges of the canvas, added ropes, and tied them to a common center under the tube. A swimmer can easily shove the loaded raft along.—*Walter E. Baker, Glens Falls, N.Y.*



Swivel makes ladder more useful

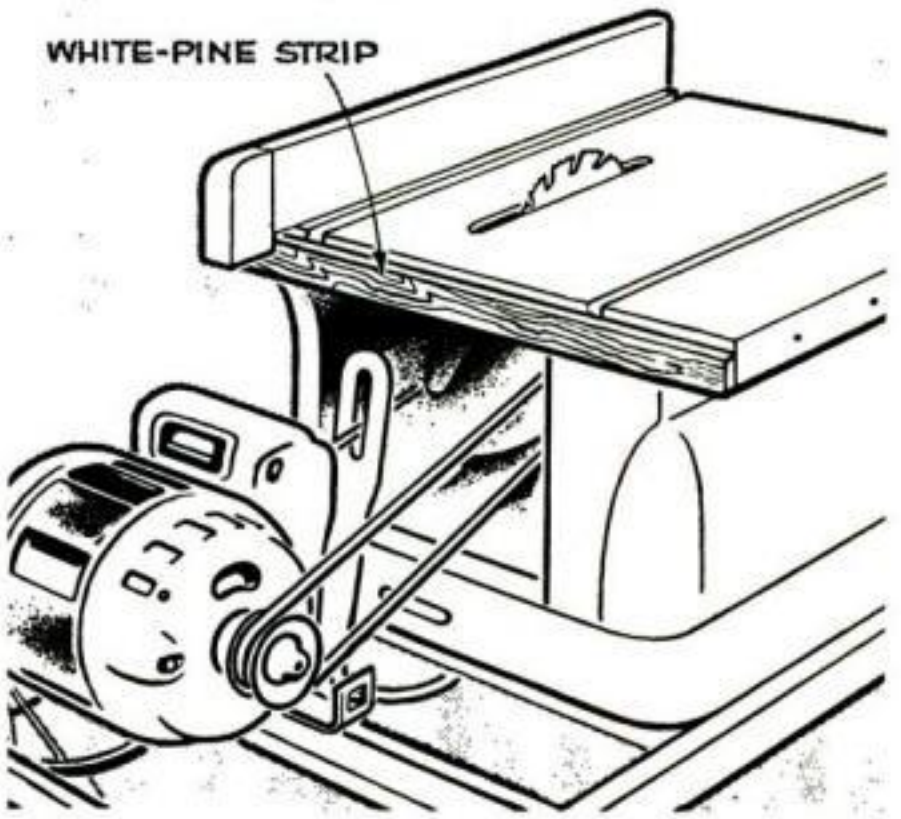
Here's an apparatus (sketch above) that I attach to my wooden ladder so I can rest it across a window while painting. By tying a piece of cardboard over the one-by-three board, I am able to place the ladder against my asbestos shingles without breaking them. Use it against aluminum siding, too.—*J. E. Weaver, Syracuse, N.Y.*

Wood pad improves saw-fence action

The clamping mechanism of my table-saw fence had gradually lost its grip on the back edge of the table, and thus the fence would move with slight pressure. I glued a thin strip of white pine to the back edge of the table top (right). This soft surface makes it possible for the clamp to grip tightly.—*A. Koblin, Baltimore.*

How to burglarproof your bike

Here's a way to make bicycle or motorcycle thieves deliver themselves into the hands of the police. With the bulb behind the sign connected to headlight generator, sign becomes visible only when bike is ridden. Be sure you disconnect it, however, before you ride the vehicle yourself.—*John Meynell, Victoria, Australia.*



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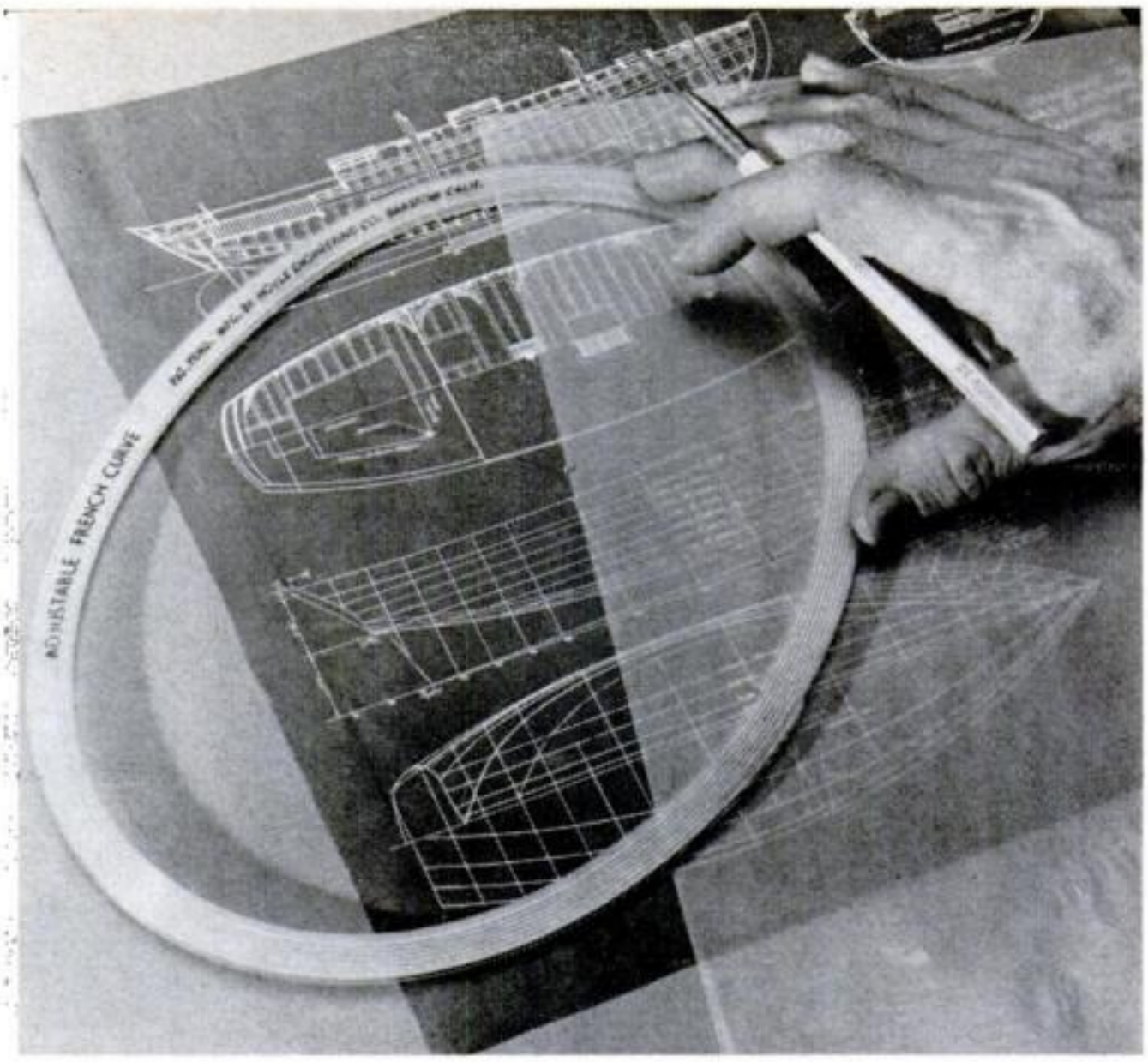
what's new in TOOLS

Whirling bits cut away paint and rust fast

Chuck the Whirl Away in your electric drill and five rotary steel cutting heads will make fast work of removing old paint, rust, or scale from metal, masonry, or wood. Cutters are said to last 150 hours. Robert C. Collins Co., 746 N.E. 67 St., Miami, Fla., sells the tool for $15. Replacement cutters for the Whirl Away cost $2.50 per set.

Square sander smooths hard-to-reach spots

Need to sand right up into a corner? You can with Rockwell's new Speed-Bloc, an orbital sander with a unique palm-grip design that permits easy one-hand sanding. It weighs 3¾ pounds. The pad is 4⅛″ by 4½″ in size, and it moves at the rate of 12,000 orbits a minute, giving fast, swirl-free finishing. The cost of the sander is $55.



Make-your-own drafting curves

Here's something for draftsmen—an adjustable French curve. You shape it with your fingers to form an accurately curved drawing guide between plotted points. It's made of interlocking strips of Tenite butyrate plastic. Manufactured by Hoyle Engineering Co., 25408 West Highway 66, Barstow, Calif., the curve sells for $2.75.

Now you can drive staples with electric power

A silicon-controlled rectifier (SCR) lets you control the driving power of this new Sears stapler to suit the material. A turn of the dial on top regulates the power to suit such varied needs as installing ceiling tile, screening, weatherstripping, upholstery, and others. The tool drives staples as fast as you pull the trigger, takes staples of five different sizes to suit the material you are fastening. Catalogue price: $58.99.

Sears has also just introduced a new variable-compression hand stapler (at $10.49) with two power settings: one for ordinary work, a second for heavy-duty jobs.

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SHOP TALK

By Robert P. Stevenson

Do you handle a saw this way? Look closely before you decide

There's no doubt about it. The hands in the photo are those of a craftsman making good progress sawing off the end of a pine board. When he draws back the saw the last time, you can be sure the finished cut will be a good one. But what about that grip on the handle? Would you do it this way? Would you make a fist with the shaped handle inside? Or would you extend your forefinger (your pointing finger) along the side of the handle? Many old-timers would. They say it gives much better control. Try it sometime—and decide for yourself.

Now epoxy enamel comes in spray cans

One of the latest products to turn up in those handy pressurized spray cans is a ready-mixed epoxy enamel. The maker, Woodhill Chemical, recommends it for recoating kitchen appliances, bathroom fixtures, and other surfaces where you want a high-gloss, porcelain-like finish. In addition to white, E-Pox-E spray enamels come in jade green, sky blue, yellow, coral pink, and copper.

What's new in the free (or almost free) department

Planning a wood-finishing job soon? Furniture? Trim? Paneling? Floors? You'll find a variety of helpful tips in Benjamin Moore's new folder, *A Guide to Interior Wood Finishing*, now available from paint dealers or Benjamin Moore & Co., 548 Fifth Ave., NYC. . . . If I were interested in building a wood deck in my yard—and many people are these days—I'd be sure to wrap up a dime and a nickel and mail them with my name and address to Western Wood Products Assn., Yeon Bldg., Portland, Ore., for their full-color booklet, *Western Wood Decks*, and a plans folder, *Three Do-It-Yourself Wood Decks*. The latter gives the plans and materials you need to build three handsome outdoor decks. Two are designed for construction on the ground, the third is raised on four-by-four posts to any height you desire.

Ingenuity at work in the wilds of New Guinea

A useful tip arrived the other day by letter from Father Anthony J. Gendusa, a former Chicagoan, who presides over the Catholic Mission of Silur-Siar, halfway around the world in New Guinea's Rabaul Territory. When the cost of a bottle capper proved beyond his budget, it occurred to him that his drill press might be just the thing for applying pressure to seat cork-lined bottle caps. It was. It worked fine.

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OR AL Vacation Sites from Uncle Sam

Looking for isolation? You're bound to find it on most of the 2,300 public-domain tracts now at auction. But they're rarely bargains!

Visit it first—before you buy that government acreage—or you may rue the day. A Californian bought a site unseen and discovered he couldn't see land for boulders.

By Ed Kerr

IF YOU have an itch to get away from it all for weekends or vacations, opportunity may be knocking at your door. Some 2,300 tracts of Uncle Sam's public-domain land will be offered at auction in 11 Western states and Alaska within the next three months. They vary from one to 1,200 acres in size. Bidding will start at anywhere from $100 to $9,000 a tract.

Public-domain land is handled by the U.S. Department of the Interior's Bureau of Land Management. It adds up to some 460 million acres in the West and Alaska. Unsuited for agriculture, it was ignored by settlers in the great westward migration. Each year a large number of tracts not needed for public use are put on the auction block.

There is no public-domain land in the states that comprised the original 13 colonies, because no areas in these states were ever federalized. This is also true in Texas. But

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public lands do come on the market in most of the remaining states, although infrequently.

If you buy from Uncle Sam, don't expect to get your hands on a garden spot, lake frontage, or mountain-streamside hideaway, however. Most of the sites are arid and rocky, far from any community or utilities, hard to get to—if there is any road at all. Water may have to be hauled in. Many sites are completely surrounded by privately owned land and you would have to get permission (sometimes refused) to reach your rugged Eden—unless you own a helicopter.

These are all reasons why the Bureau of Land Management suggests that prospective bidders inspect the location they are interested in before putting in a bid.

Westward, ho! Despite such pioneering challenges, in the last 10 years nearly 55,000 outdoor lovers have bought tracts, averaging 2½ to five acres. A few have built elaborate homes, brought in utilities, even built roads. But the majority settled for the simple life—in lean-tos, cabins, tents, camper-trailers.

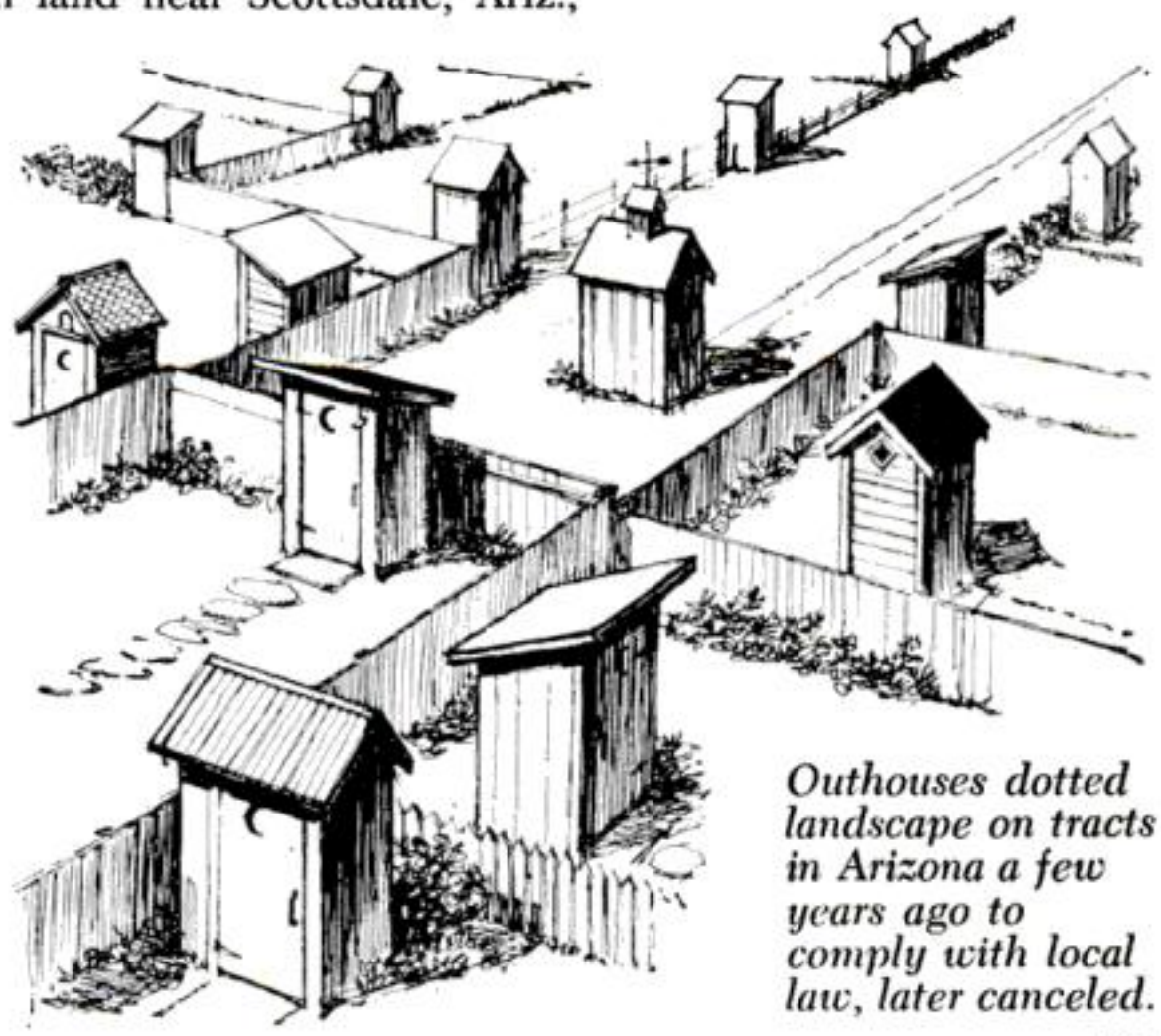
As the Bureau of Land Management puts it, "Anyone looking for plenty of outdoors is seldom disappointed when buying a tract from the public domain—not even a hermit."

A few buyers get in on the deal with speculation in mind. But remember that the government retains all mineral rights. Recently a family of five from Riverside, Calif., bid on five adjoining tracts. Were they building a family community? Not at all—they bought and built an airfield. Residents of Ajo, Ariz., which has an ordinance that prohibits keeping horses, bought tracts to stable their horses.

The 2,300 tracts now being put up for auction may be the last large offering before restrictions under new legislation go into effect. These would make land use and construction conform to local zoning and building codes and prevent public-domain lands from becoming eyesores. The Bureau of Land Management has announced that it will not open additional small tracts in a county unless previous ones are developed in conformance with good planning principles.

An amphibious trailer on land bought from Uncle Sam serves as a vacation retreat for an Alaskan couple. They propelled it across Cook Inlet, then towed it five miles up a mountain trail to their tract.

A well-meant requirement on land near Scottsdale, Ariz., backfired unexpectedly a few years ago. The Bureau required all site purchasers to put up flyproof outhouses. This led to a booming business for a contractor who specialized in "BLM outhouses, built to specifications." As a result, 78 vividly painted structures (deep purple to bright orange) mushroomed, to the consternation of nearby residents. The requirement was later canceled, and everyone enjoyed a huge bonfire.



Outhouses dotted landscape on tracts in Arizona a few years ago to comply with local law, later canceled.

Don't expect any free land these days—even from the government. Land is never sold for less than its appraised value; it's sold always

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Beware of "auction fever" when bidding starts at a land sale—or you may pay too much. You don't have to be there; you can mail in a bid and hope no one tops you.

on a bid-auction basis. You don't have to go to an auction; you can bid by mail. But visit the site first.

Beware of so-called "public-land information companies." They advertise that thousands of acres of government land are on the market "free for the asking or dirt cheap." Not so. You can get reliable information about public lands for sale from only one published source—the Bureau's magazine, *Our Public Lands*. You can subscribe by sending 60 cents (for a year) to the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402.

What can you buy? Here is a *sampling* of smaller tracts of land (up to five acres) that will be offered for sale soon:

- Alaska—10 tracts, averaging 2½ acres, appraised at approximately $300 each. At Salmon Lake, 40 miles north of Nome, in an area of fine fishing and scenery.
- Arizona—260 tracts, 66 in Maricopa County, 45 miles from Phoenix. All are 2½ acres, appraised at from $435 to $835. Shopping and medical centers, church, and school within 20-minute drive, utilities available in the vicinity. In Pinal County, there are 17 tracts of 2½ acres, appraised at $2,000 each. Near Superstition Mountain. Desert terrain.
- California—1,559 tracts, mostly in Kern, Inyo, and San Bernardino counties. Sizes range from 2½ to five acres, valued at from $200 to $9,000, most in desert areas.
- Colorado—71 tracts, ranging in size from ½ to seven acres, in price from $500 to $6,500. They range from rough, rocky, sloping terrain to flat land without trees.
- Idaho—28 tracts, 18 in the high mountain valley of South Snake River, appraised at from $100 to $450.
- Nevada—80 tracts, some near Reno, others on a slope facing the Sierra Nevada mountains with a good view of surrounding country. Sizes range from 1½ to five acres, valued at from $200 to $3,000 an acre.
- New Mexico—20 tracts, from 2½ to four acres appraised at $200 to $450 a tract.
- Wyoming—27 tracts. Ten in the Casper Mountain area are 2½-acre sites appraised at $1,200. The others—two to four acres valued at $800 to $1,850 a tract—have no surface water, but drilling might tap water.

In most of these states (and Montana, Oklahoma, Utah) larger "public-sale" tracts are also on the auction block. They range up to 1,520 acres, appraise at from $4 to $4,000 an acre. Some of this land is suitable for grazing and irrigation. Lands in other states may be offered in the future.

For complete information on public-domain lands, visit or write these Bureau of Land Management offices:

Alaska, 555 Cordova Bldg., Anchorage, or 516 2nd Ave., Fairbanks; *Arizona*, Federal Bldg., Phoenix; *California*, Federal Bldg., Sacramento, or 1414 8th St., Riverside; *Colorado*, 700 Insurance Exchange Bldg., Denver; *Idaho*, 323 Federal Bldg., Boise; *Montana* (also the *Dakotas*), 1245 N. 29th St., Billings; *Nevada*, 560 Mill St., Reno; *New Mexico* (also *Oklahoma*), Federal Bldg., Santa Fe; *Oregon*, 710 N.E. Holladay, Portland; *Utah*, 3216 Federal Bldg., Salt Lake City; *Wyoming* (also *Nebraska, Kansas*), 2002 Capitol Ave., Cheyenne; *Washington*, 680 Bon Marche Bldg., Spokane; *Eastern States*, LaSalle Bldg., 1728 L Street Northwest, Washington, D.C.

Be sure you have access rights before you buy. If owners of surrounding property bar you, you may have to resort to a helicopter to reach your Shangri-La.

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A Second Home for Vacations

Super-simple design saves time, money

LIKE a second car, an extra home for vacation use is becoming part of American family life. But should it be just a simple rustic cabin? Or should it be a comfortable home-away-from-home with all the modern conveniences?

Here's a vacation home that offers the best of these two worlds. For little more than the cost of a cabin, you can build the basic shell—foundation,

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Designed for leisure, the Skamania home demands little maintenance. Easy upkeep makes it a fine choice for retirement living as well as for vacation-season use. Two 8′-wide glass doors bring light and spaciousness inside. A long roof overhang shades the big porch.

walls, and roof. That gives you a weather-tight "starter" house in which you can rough it while fishing or hunting, or live while you finish the interior.

With an eye to the future, and its site well chosen, a second home can be more than a vacation luxury. Many a forward-looking owner makes it suitable for year-'round use. Then, after it has served the growing family for vacation-time fun, the parents can move into it for retirement living.

You may have quite different ideas for your own leisure-time house. But the cash and laborsaving features in this one can be adapted to the simplest fishing cabin or the fanciest beach house. It's built inside and out with new materials just coming on the market. All were created with an eye to low cost, easy construction, and minimum maintenance. There are also some crafty but sound simplifications (no roof rafters, for example) that can save you labor costs or make it easier for you to do your own work.

The interior. The room arrangement is simple, and the interior is brightened by big glass areas. Architect-designed for the Georgia-Pacific Corp., manufacturers of lumber and other forest products, the house has two good-size bedrooms, a living room with a fireplace wall, an 11′-by-12′ kitchen-dining room, and an 8′-by-24′ patio.

The original was built at Skamania Landing, Wash., an old Indian campsite on the Columbia River. Despite a long haul for carpenters and materials, the cost of this professionally built home (exclusive of land) was only $9,505—about $10 per square foot.

This figure includes a dual (both circulating and radiant) electric heating system, hand-split cedar roof shakes, wall insulation, a tiled bath, two 8′-wide sliding glass doors, hardwood kitchen cabinets, wiring, plumbing, landscaping, and even a surfaced parking space. The man who builds his own, or is willing to dispense with some extras, can whittle the cost way down.

The house is designed for maximum use of standard 4′-by-8′ sheets of hardboard or plywood. These require a minimum of cutting, except around doors and windows, so there is little waste. Though the original house made use of new kinds of factory-primed and factory-finished hardboards (all now available nationwide), it can also be built of ordinary lumber or with standard types of plywood.

It stands on a slab, cast on 12′-wide footings all around and sealed with a plastic membrane. This solid foundation eliminates

Looking down the 22′ length of the living room, there is a 9′ fireplace wall at the left. Small door straight ahead is for coat closet. Beyond, through open door, bedroom is seen.

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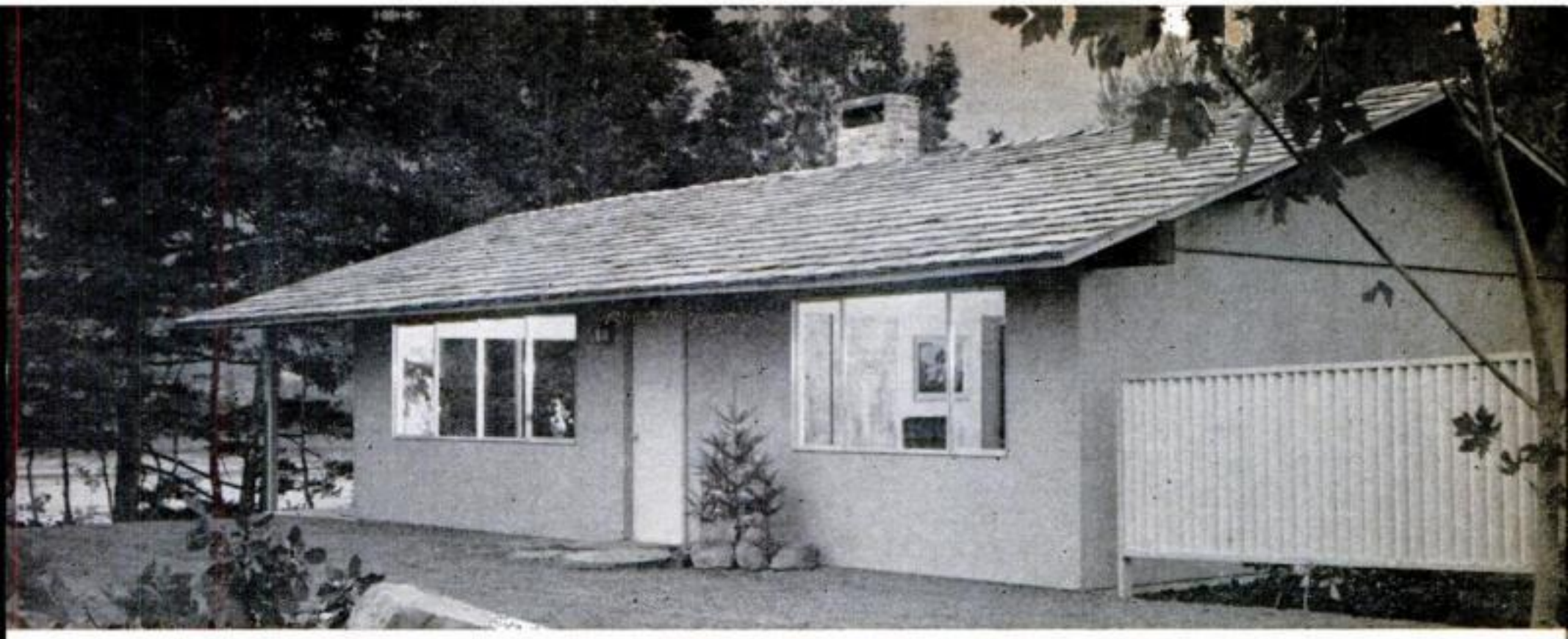


The front door opens on the living room, which has a 4′-by-12′ window area. Both bedroom windows (one at near corner above) are 8′ long. Eaves 3′ wide shield window walls from direct sun during much of the day. The roof is finished with hand-split cedar shakes.

the usual floor joists and bridging. Extra footings are provided under the fireplace and two porch posts.

Only the outside walls bear any appreciable load. They are assembled flat, with two-by-four studs spaced on 16″ centers nailed to top and bottom plates. Outside hardboard siding is nailed directly to the gridwork of studs before the walls are raised into position.

Rafterless roof. The roof is laid on five big beams that run lengthwise of the structure. You don't need outside lumber for these, but build them up right on the job. Two two-by-twelves are nailed together with a stiffening filler of ⅜″ plywood between. Where the beams show, they are trimmed with plywood on the sides and a finish board underneath.

Two-by-six tongue-and-groove decking is laid across the beams. The exposed bottom surface of this forms the vaulted ceiling of the living and dining areas. On the weather side, shingles or shakes, over a layer of felt, finish the roof.

In the bedroom and bath areas, ceiling joists are laid across the partition framing. Plywood nailed to these, and acoustic tile stapled to the plywood, make a quiet, attractive ceiling of standard 8′ height.

Wiring and rough plumbing would normally be installed next, the fireplace built, insulation and interior paneling applied. Budget builders should pour the fireplace footing along with the foundation, but could postpone building the fireplace. The prefinished hardboard paneling used in the house shown comes in a wide choice of beautiful wood grains, giving a finished wall as soon as it is nailed up.

Building time. How long it took experienced craftsmen to do the major parts of

CONTINUED

Walls in the bedroom below are paneled with marproof hardboard in light-toned natural oak. Floor area is 11′6″ by 11′9″. Standard 8′ bedroom ceilings are finished with acoustic tile.

Kitchen conveniences include 18′ of matched hardwood cabinets and a 30″-wide pantry (just visible to right of stove). The cabinet veneer is bonded to a nonwarping flakeboard core.

HARD-BOARD CEDAR SHAKES

2"x6" JOISTS 16" O.C.

15# FELT

2"x6" T.&G.

2"x3"

2-2"x12" OVER L.R. WINDOW, 3/8" PLYWOOD BETWEEN

INSULATION

2"x4" 16" O.C.

5/16" HARDBOARD, RUSTIC SIDING, TEXTURE 1-11, OR REDWOOD SIDING

PLYWOOD OR HARDBOARD PANELING

TILE FLOOR ON 4" CONC. SLAB

PERIMETER INSUL'N. 24"

2"x4" SILL, 1/2"x10" BOLTS 8' O.C.

POLYETHYLENE FILM

4" DRAIN TILE

POURED-CONC. FOOTING

8"x16" FLUE

2-2"x12"s

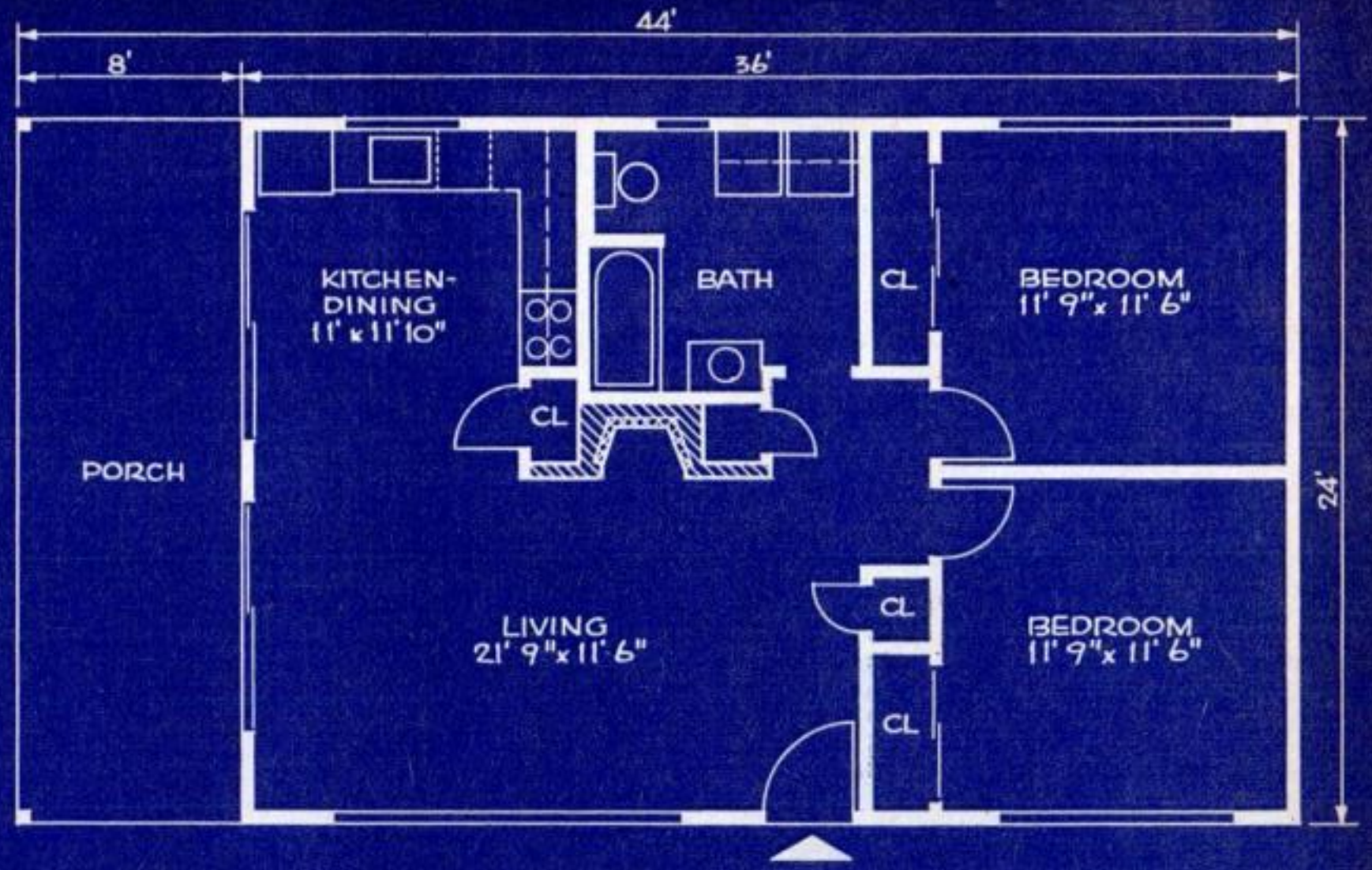
INSULATION

WOOD-GRAIN HARDBOARD

BATH

LIVING

PERIMETER FOOTING, BELOW FROST



2"x6" ROOF DECKING EXPOSED

2'9"

2"x6" 24" O.C. INSULATION

4"x8" OVER DOORS

KITCHEN

BEDROOM

4"x4" POST

3'

5/16" HARDBOARD, PAINTED

8"-THICK FIREPLACE FOOTING

Grandeur of 1,000-foot cliffs and the mile-wide Columbia River frames the house site. Here the slab has been poured. A nearby lake offers fishing, swimming, and boating.

Walls are up in this photo, but the last of the roof decking is still to be applied. Felt and shakes (or shingles) go over the decking. The aluminum windows are all stock sizes.

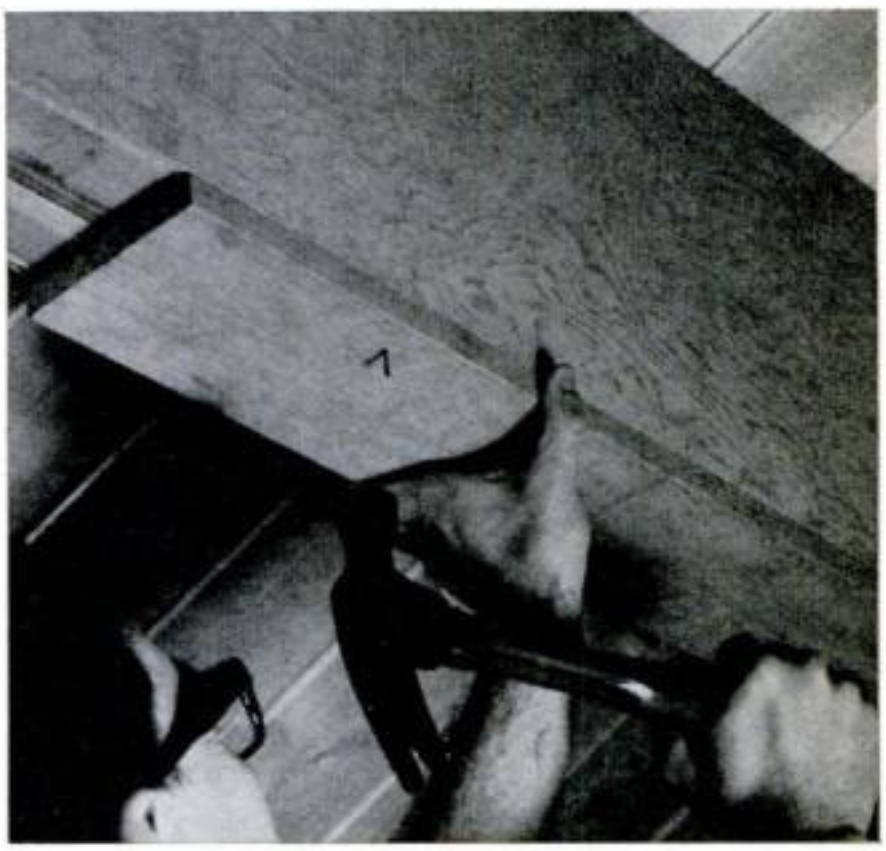
the job may serve as a guide to vacation-home builders. The actual times will vary, of course, with conditions and the skill of the workmen.

- Excavation for footings and leveling for the slab, done by both bulldozer and hand labor, took eight hours. This is highly variable as it depends on the slope, ground condition, and weather.
- Forms for the footings and slab were set up in eight carpenter-hours.
- Framing, which included nailing on the exterior siding as well as making the laminated beams and applying roof decking, took two carpenters six eight-hour days, a total of 96 man-hours.
- Roof shakes were applied in 20 hours; composition shingles might take only 16.
- Paneling interior walls took 24 carpenter-hours.
- Casings, trim, and prehung doors were installed in 32 man-hours.
- Painting took 48 man-hours. Much time was saved by using factory-primed panels that could be finished with a single surface coat.

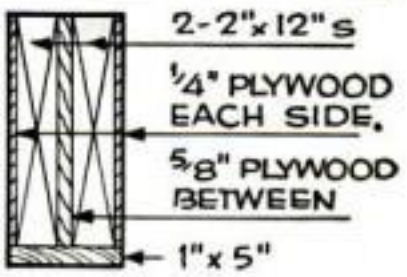
How to get detail plans for house

Building plans, a list of materials needed, and other helpful information about the Skamania house described in this article are available as a package for $1. A part of the working print you will get is shown on the facing page.

Send your payment, with your name and address, to W.F. Rooney, Georgia-Pacific Corp., Box 311, Portland, Ore. 97207.

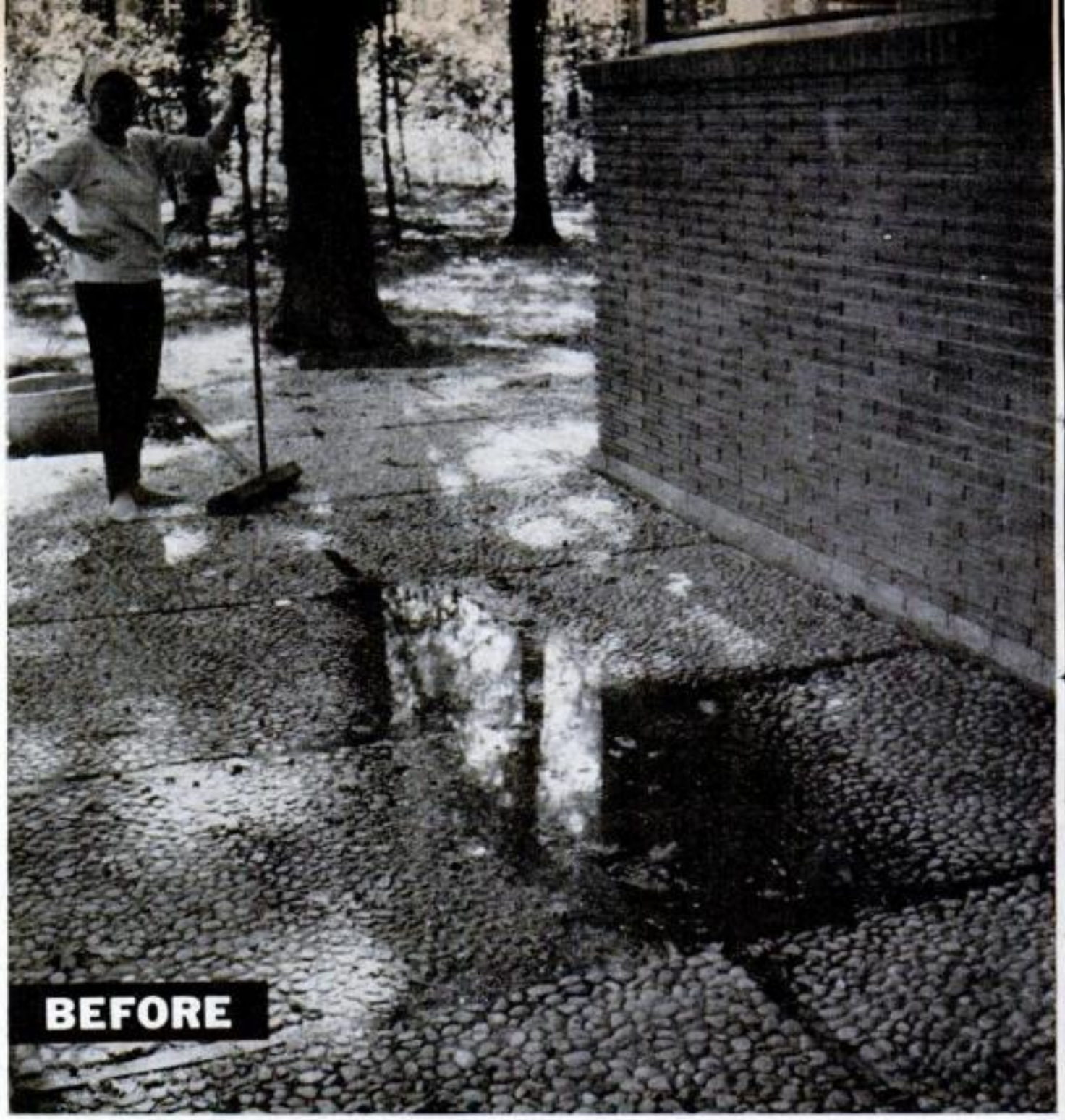


Beams are built up of two-by-twelves with a plywood stiffener between. Where exposed, they're finished with plywood sides and one-by-five trim as above.



New preprimed "paint panel" requires no taping, sanding, or nail patching. This kitchen corner shows how partition-wall framing separates flat and vaulted ceiling areas.

Is your patio a birdbath every time it rains? Does your walk or driveway look like a roller coaster? Here's how to set things straight again



The Easy Way to Raise

By Richard Day

CONCRETE slabs will withstand any load they are designed for *if* they have uniform support. But too often concrete is poured over fill that hasn't been fully compacted. This may settle long after the concrete has set. The sad results: tilting entry slabs, slanting sidewalks, dished patios that collect rainwater pools, cracked driveways and porch slabs.

On highways, contractors raise dropped pavement by "mud-jacking"—pumping cement grout through holes in the slabs. You can use a simpler method based on this technique to level sunken slabs. It was devised by a structural-concrete engineer to repair a sunken sidewalk in front of his own property.

Instead of pumping concrete under the slab, you lift it mechanically and pour in grout to fill the space. A slab sunk on only one side needs just one jacking and grouting. A slab sunk on all sides needs two jackings and two groutings, with time between for the first grout to set.

Jacking can be done with 12″-long threaded rods and two-by-fours. The rod (available at hardware stores) is screwed into a concrete anchor set into a hole drilled in the slab. There are many types of anchors, but the cheapest and best have a tapered steel plug in a lead sleeve. They're called screw anchors or expansion anchors, or bear such trade names as Ackermans and Tampins. Once the lead sleeve is set into a blind hole with the special driver furnished, the harder the pull on the plug, the tighter the sleeve wedges.

Screwed into an anchor, the threaded rod passes through a two-by-four blocked up to form a bridge support. When a nut

CONTINUED

Urheberrechtlich geschütztes Material

Sunken Concrete Slabs

1 **First drill** blind anchor holes, making them a little deeper than the length of the anchors to be used, where jacking force is to be exerted. A ½" or bigger hole through which you pour the grout must be drilled completely through concrete slab.

2 **Sitting down** on the job—on a board on top of the drill—is easiest way to apply heavy pressure to larger-size carbide bits. Hold the drill switch so that it will pull away and shut off if the bit grabs in the concrete, twisting drill under you.

3 **Drop a concrete anchor** into the blind hole in the slab. Then use the driving tool that is furnished with the anchors to set it. This expands the lead jacket against the walls of the hole so that it will hold firmly against the pull of jacking.

Urheberrechtlich geschütztes Material

4 The jack is a threaded rod 12″ long that fits the steel insert in the anchor. Push the rod through an oversize hole bored edgewise in a two-by-four. Prop this up solidly on a support placed near the slab to be raised.

5 Slip a couple of washers on the rod and turn on a nut. Tighten two nuts against each other at the top. Turn the topmost nut to screw the rod into the anchor for jacking. Turn second nut as shown to unscrew the rod.

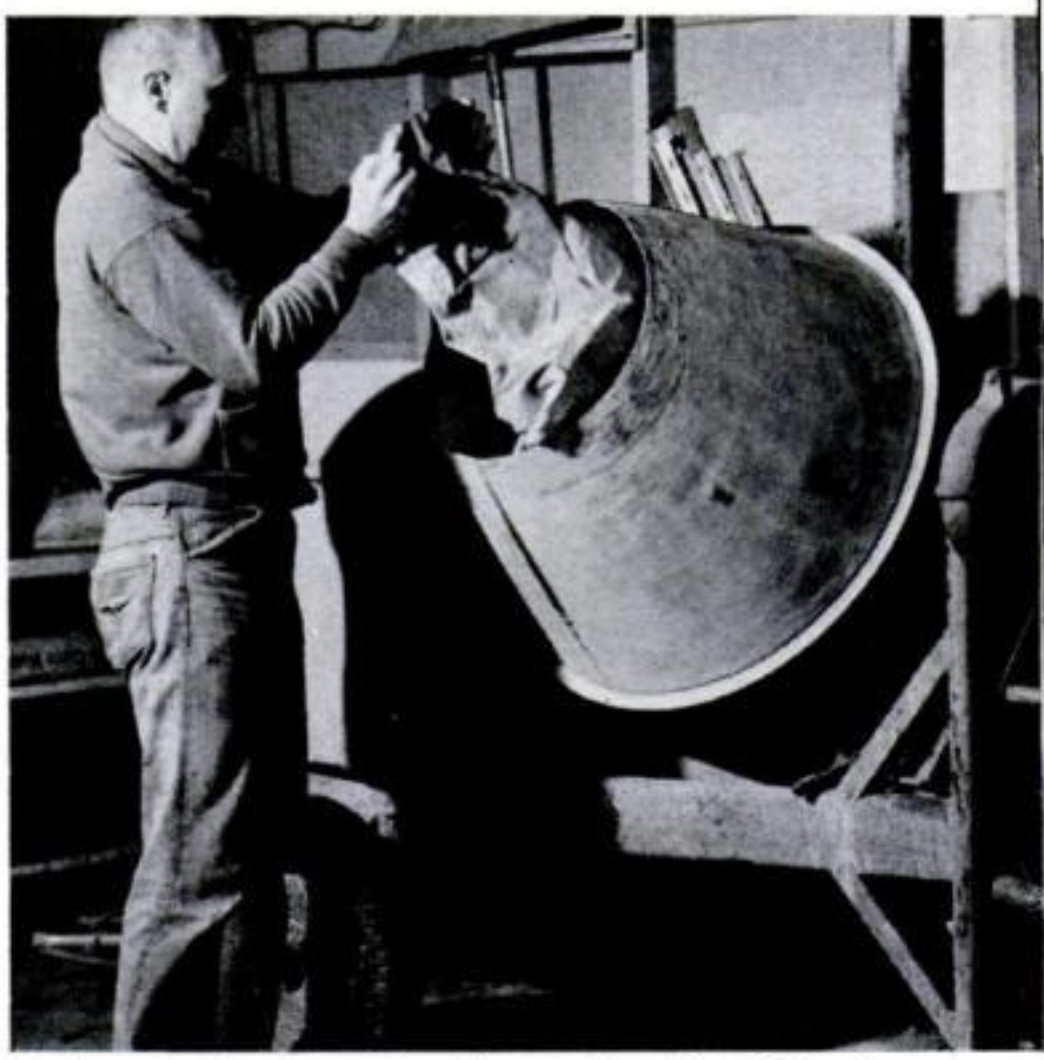
on the rod is tightened against the two-by-four, the rod raises the slab.

The slabs I lifted were 4″ thick and 48″ square. I used two jacks, one near each sunken corner, screwed into ⅜″ anchors set into ¾″ holes. Smaller or thinner slabs can be raised with smaller anchors requiring less drilling effort. Heavier slabs would require bigger anchors, with four-by-fours or four-by-sixes.

To drill the holes in the slab you'll need a husky electric drill and a carbide-tipped masonry bit. The ½″ drill I rented was amply powerful for making ¾″ holes. For 1″ and larger holes, it pays to drill a ⅜″ pilot hole first and then enlarge it to size. If you drill many holes, watch the bit's cutting edges. When they show 1/64″ wide lands (flats), resharpen the bit on an 80- to 100-grit silicon-carbide wheel.

Besides blind anchor holes, you must drill a pour hole for the grout all the way through. It should be at least ½″ in diameter and somewhat closer to the center of the slab than the anchor holes.

You can mix grout in a wheelbarrow, but a rented concrete mixer makes smoother grout and saves labor. One sack of cement and six gallons of water make about 1.3 cubic feet of grout without sand, 1.6 cubic feet with two 10-gallon pails of sand. But calculations of slab area and the depth to which it has sunk don't always accurately predict the amount of grout needed. The subgrade may have sunk more than the slab. I needed nearly three times the amount of fill I had originally estimated.



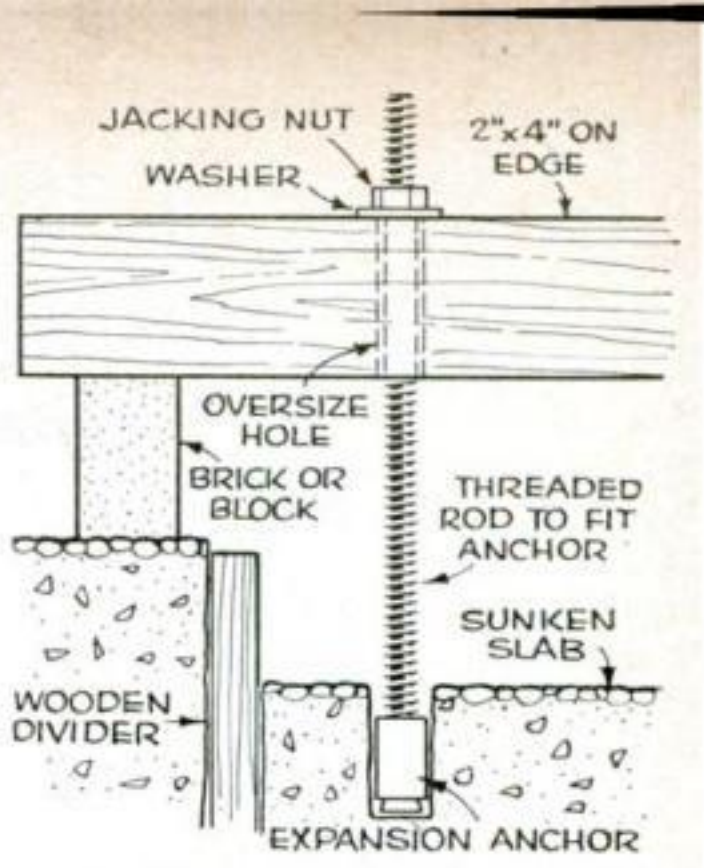
7 A rented mixer speeds up the job. Mix six gallons of water to one sack of cement. Two pails of clean lumpless sand may be added to reduce cost, but mix must be pourable. Use half a gallon less water if sand is at all moist.

It's safest to leave the jacks in place overnight. Be sure to let the grout set overnight before you use a raised slab as a support for jacking up another. Otherwise, it may collapse.

Form boards or dividers left between slabs probably can't be raised. Cut wedge-shaped fill strips, creosote them, and nail them to the sunken boards.

When you are raising cement slabs with

Urheberrechtlich geschütztes Material



6 **If slab is sunk** at one side only, two-by-fours can be supported at the unsunken end and on next slab. Raise sunken slab by tightening the bottom nuts on the jacks alternately. Check the slab with a level in both directions. Set the two-by-fours on edge for maximum rigidity, as shown. They must be solidly supported, with ample clearance above the slab to be raised. Tightening the bottom nut pulls up the rod and lifts the slab.

8 **Pour soup-like grout** through the hole to fill void under the raised slab. A big funnel is a must. A 48" piece of aluminum tubing gives a more positive flow. Weight and suction of grout in it will pull down small lumps.

9 **Wire-brush spilled grout** off after it has hardened slightly. Leave jacks in place at least until grout begins to set. Fill holes with a 3:1 sand-cement-water mix. Bolts (above) screwed into anchor will help lock it in.

exposed edges, stake form boards in place to contain the grout, or pack a stiffer mortar under the slab from the edges, instead of pouring grout.

Bound-in slabs—sunken ones on which surrounding concrete has closed in—may be impossible to raise. Unless the imprisoning masonry can be lifted and reset, the only solution is to break up the bound slab and cast a new one. ■■

		AREA OF SLAB (square feet)				
		4	16	36	64	100
THICKNESS (inches)	2	One #6	Two #10	Two 3/8"	Three 1/2"	Four 1/2"
	4	One #10	Two 3/8"	Three 1/2"	Four 5/8"	Four 1"
	6	One 5/16"	Two 7/16"	Four 1/2"	Four 1"	Six 1"

Size and number of anchors needed to lift slabs of various sizes easily is shown above. Only one edge is lifted at a time. If its edges will encounter no friction, the slab may be figured as half the area that it really is.

Urheberrechtlich geschütztes Material

[Continued from page 59]

● Larger wheels with vent holes will improve heat dissipation.

Several mechanical improvements are either in production or close to it:

● Better-balanced spring systems in duo-servo drums.

● More-reliable automatic adjusters permitting closer tolerances and giving more consistent action.

● Stronger backing plates to guard against bending and cracking

● Shoe guidance by bosses working on the webs instead of letting the shoe edge rest against the backing plate. (Cadillac already has this refinement, and Ford will probably have it in 1967.) In addition to providing better guidance, it eliminates a potential source of noise and the risk of getting grease on the linings. (Pontiac reduces the grease risk by fitting linings of less than shoe width.)

Brake-lining properties have some effect on every aspect of brake performance. The auto makers now seem willing to pay more for linings, and their quality-control procedures have become stricter. The major brake-lining producers have very active programs of chemical research in both organic and metallic lining materials. The 1966 cars will have new and better linings with higher fade resistance, lower speed sensitivity, improved stability, longer life.

Improving the hydraulic system. Even the hydraulic circuit is enjoying small improvements. Rear wheel cylinders will be smaller than the front ones to give better brake-force distribution and prevent rear wheel locking. (Pontiac already has this.)

Brake pipes will get bigger to speed brake response and reduce viscosity changes in the brake fluid in cold weather. (Pontiac has ¼-inch pipes now—all others $^{3}/_{16}$-inch.)

Impregnated sintered-iron wheel-cylinder pistons with high lead content are replacing aluminum pistons. Iron pistons are self-lubricating and give smoother action. Ethylene-propylene dust boots are coming into use. They do not age or crack like rubber.

Disk brakes. Some of the problems that drum-brake engineers are trying hard to solve are nonexistent with disk brakes. They are practically fade-free and insensitive to weather. Disk brakes are essentially stable (since they are not self-energizing, there's no pull). Response is proportional to the pedal effort, and there's no risk of non-uniform burnishing. If pad wear is a problem, pad replacement is simple.

There's only one basic point in design where disk-brake engineers disagree. Should the pad be in constant contact with the disk? Bendix, Budd, and Delco-Moraine say yes; Kelsey-Hayes says no.

In all other respects, disk-brake engineers agree on development trends and concentrate their research in these areas:

● Noise elimination by better pad guides and non-squeal materials.

● Shorter pedal travel by reductions in fluid displacement (smaller pistons and shorter piston travel).

● Reduced caliper flexing by wider and stronger bridges.

● Reduced risk of fluid boiling by plastic pistons that will reduce heat transfer to the brake fluid (this can be a severe problem with disk brakes because boiling temperatures can be reached without brake fade—and fluid boiling means complete loss of braking force).

● Reduced cross splash and dirt ingress by fitting caliper splash shields (the disk itself is self-cleaning, but the caliper assembly is not).

● Prevention of friction-pad crushing by means of larger pads and more pressure-resistant materials.

● Reduced pad-surface powdering (caused by destruction of binding agents at high temperatures) by means of more-heat-resistant materials.

● Lower costs as a result of fewer parts. It has proved possible to combine several functions in one part. (Example: the Kelsey-Hayes quad ring—a small rubber ring of rectangular cross-section—which performs piston sealing, automatic adjustment, and retraction. On brake application, the quad ring lips are stretched; on release they simply roll back.)

While four-wheel disk brakes promise perfect front-rear compatibility, and the need for power assist can be diminished, it looks as if the most practical long-term solution for mass-produced cars lies in the Instantor brake. It was invented by Nelson Brownyer, who first made history by designing Timken's ventilated disk brake for street cars back in 1925. It may become just as important to the industry as the hydraulic duo-servo—introduced by Bendix in 1934 and practically universal today. ■ ■

Urheberrechtlich geschütztes Material

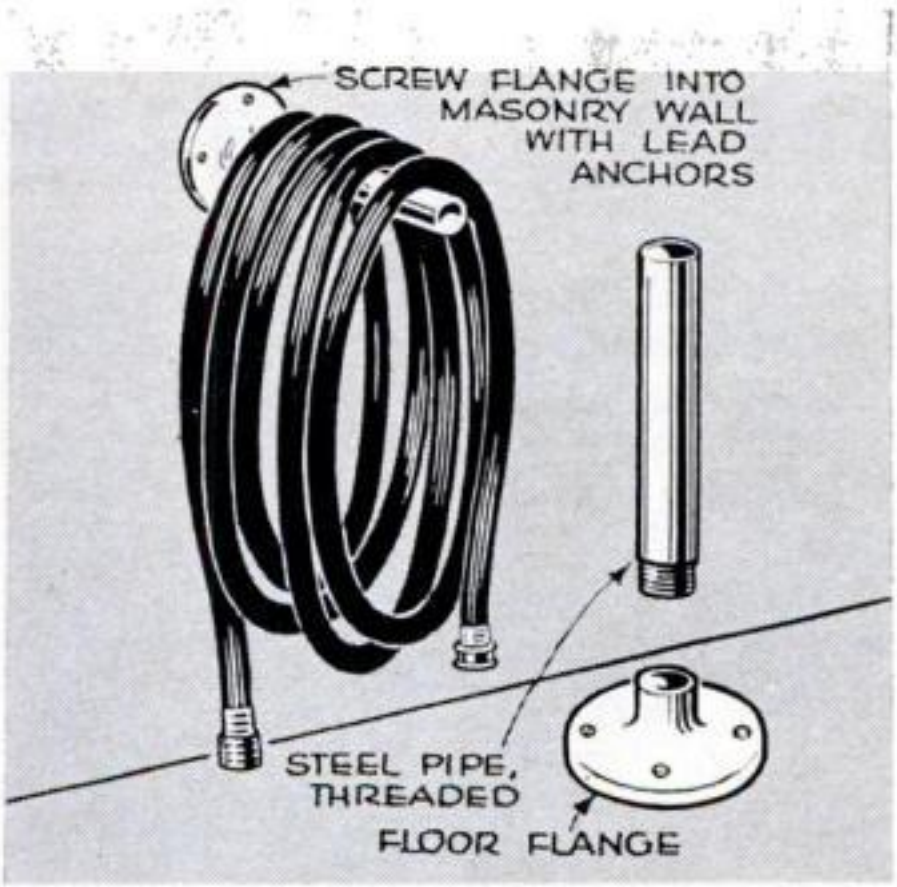
Short Cuts and Tips FROM PS READERS

Hide-away chest holds assorted Polaroid gear

Storing my Polaroid equipment was a problem until I hit on the idea of keeping it in a steel under-bed chest with a pull-out handle. Cost: $5. And that handle makes it portable. To separate my gear, I use transparent shoe boxes and food containers. There's even room, as you can see, for a titling board and a tripod. Why no camera? I used it to take this photo.—*John Calder, Laurel, Md.*

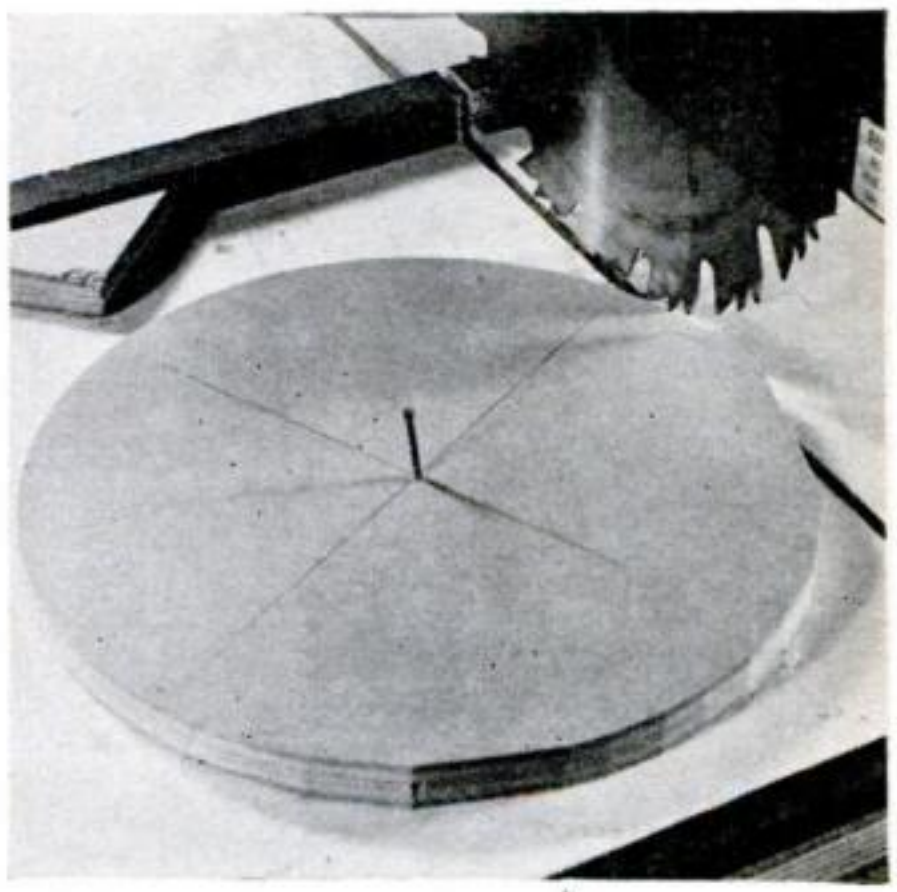
Ring adds zipper grip

Boat canvas, outdoor covers, and rear windows in convertibles have zippers that break fingernails. For a grip, slip a key ring through the tab.—*Henry R. Rosenblatt, Newton Center, Mass.*



Pipe makes handy wall hangers

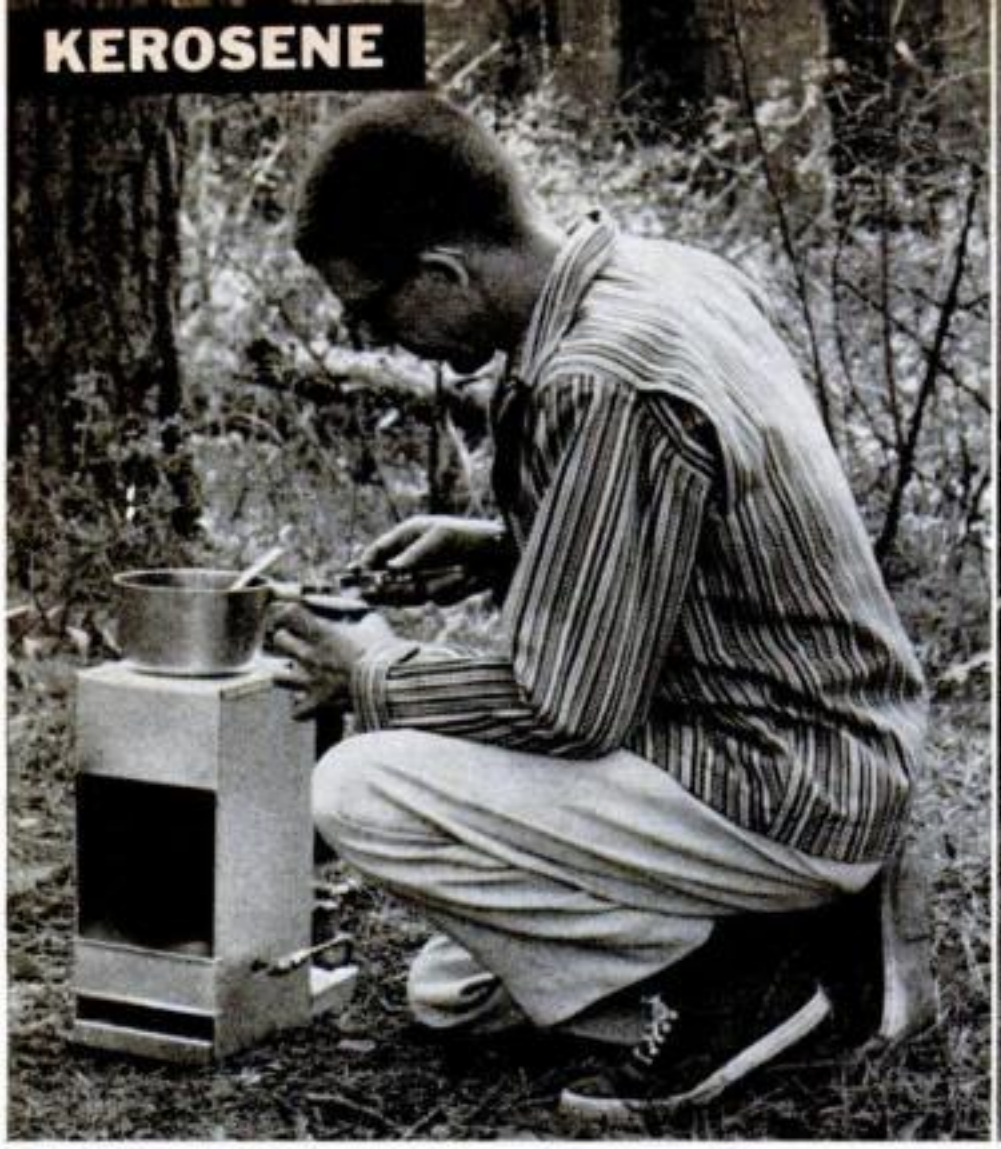
To make hangers for heavy ladders, coils of rope, or hose I use short lengths of steel pipe threaded at one end and screwed into steel floor flanges. The floor flanges are then fastened to the concrete wall with lead anchors and screws. Flanges come in several sizes and weights. Things hung this way are easily removed when needed, and floor space is increased.—*Sam Coiner, Tampa.*



Cutting circles with a radial-arm saw

Cut perfect circles on a radial-arm saw with this pivot method. Distance from nail to saw blade equals the radius of the work. Make straight cuts, turning the work about 15 degrees after each pass. Then lock the blade at the forward edge of the table and slowly revolve work into the turning saw blade for the final cut.—*R. J. De Cristoforo, Los Altos Hills, Calif.*

Urheberrechtlich geschütztes Material



Northland Midget. You can use the flat top of this camp stove for cooking; it will also keep your tent or trailer warm. Kerosene is gravity-fed through a carburetor for even flow and increased efficiency. Height, 15"; base, 6¾" by 11¾"; weight, 7¼ lb.; fuel capacity, 2 qt.; burning time, up to 12 hours; heat output, 10,000 BTU per hour; price, $21.50. Maker is Northland Stove Co., De Tour, Mich.

Anderson Aladdin Blue Flame. Top of this kerosene heater holds one pot. Narrow upper section is hinged for packing. Height, 20¾", with 14½" base diameter; weight, 11 lb.; fuel capacity, 1.3 gallons; burning time, 16 to 25 hours; heat output, up to 9,320 BTU per hour; price, $39.95. Maker is Anderson Heating, Inc., 732 N.W. 24 St., Miami, Fla.

Take Along Your

One of the new camp heaters and stoves can make your trip a warm delight rather than a cold disaster

By Marv Lindberg

NOW more than ever, taking along a camp stove or heater will make your summer outings more pleasant. A series of dry years have led an increasing number of states to prohibit campfires. And in some areas, wood for a campfire is simply not to be found.

Besides giving you quick warmth, cooking, or light (some of the more versatile models do all three at once), the new crop of camp heaters and stoves will let you extend your personal camping season comfortably into the fall—when camp grounds are considerably less crowded.

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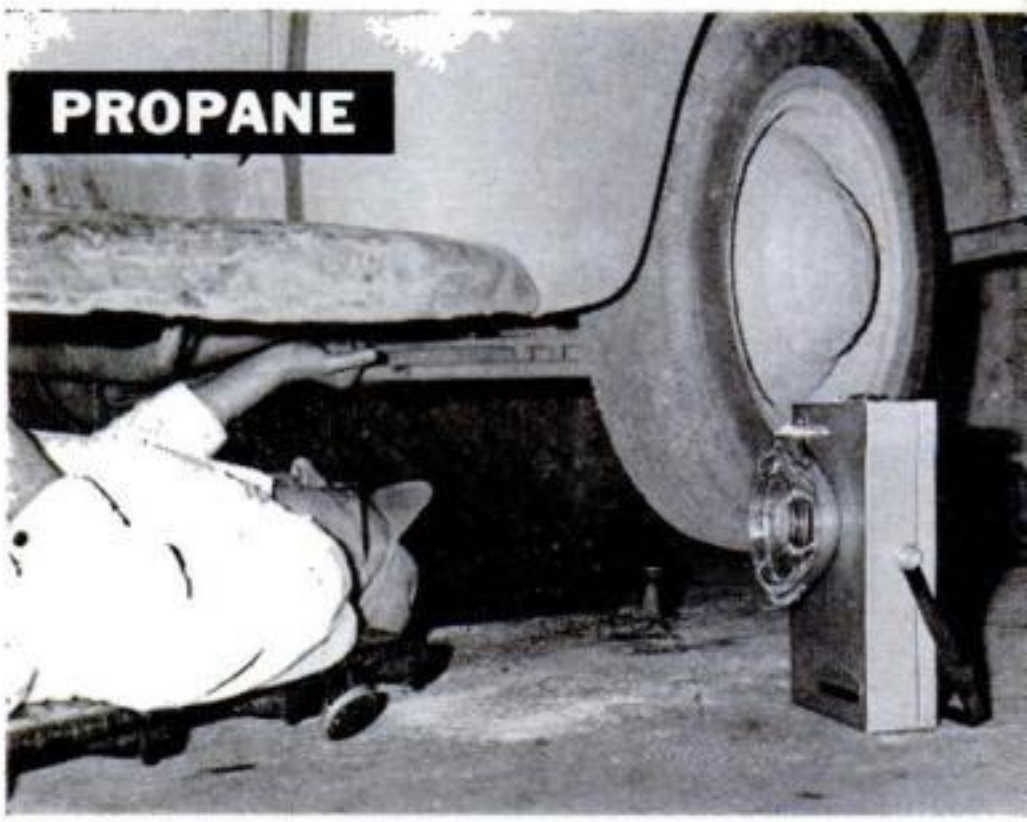


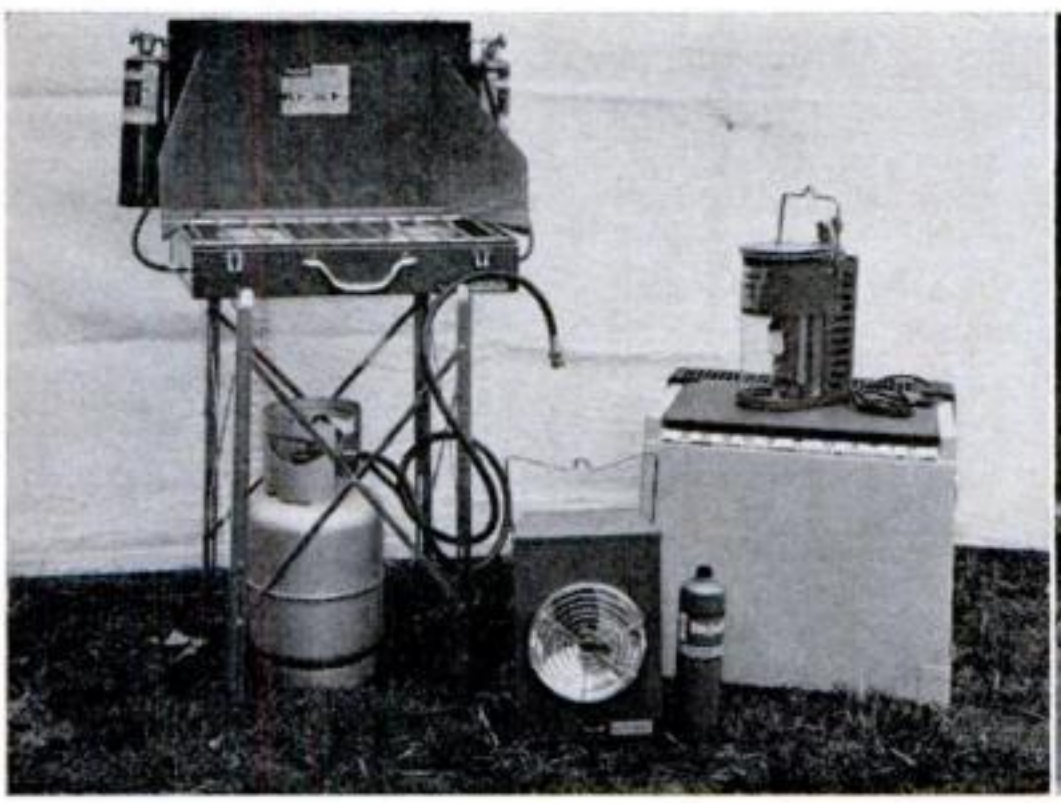
Turner LP-2440. This propane-fueled radiant heater has a handle that adjusts to prop it in any position. A bulk fuel tank with hose adapter can replace throwaway propane cylinders for greater economy. Height, 13"; base, 5½" by 8"; weight, 8 lb.; two-cylinder fuel capacity; heat output, 2,300 BTU per hour; price, $34.95. Turner Corp., 821 Park Avenue, Sycamore, Ill.

Urheberrechtlich geschütztes Material

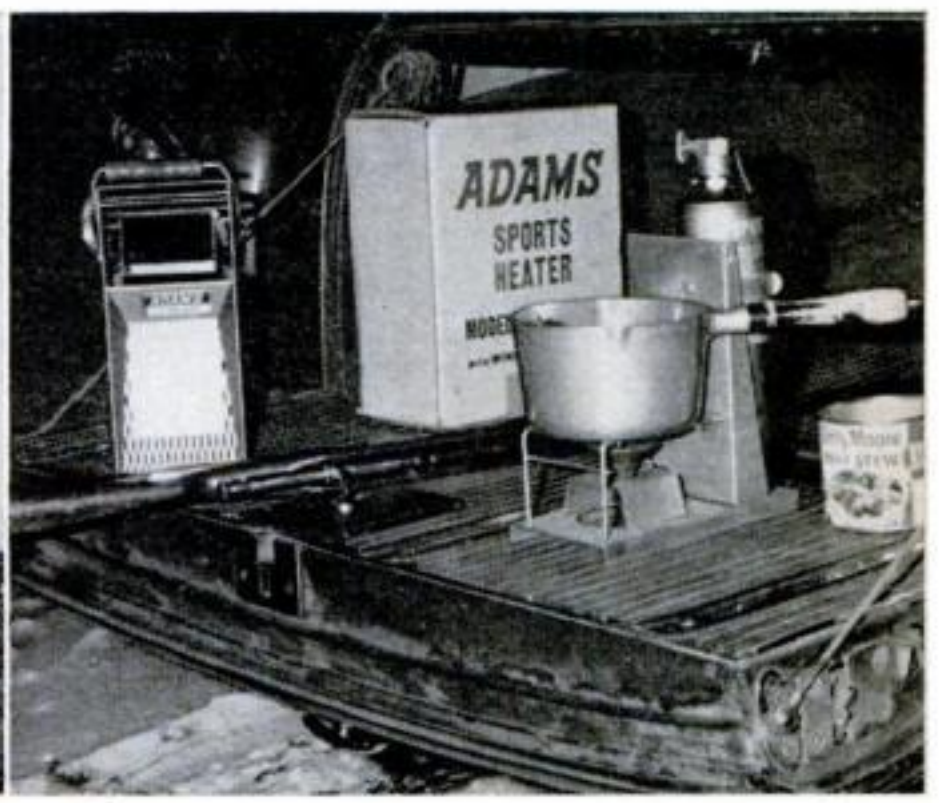
Thacker Tilley AL-620. Combination radiant heater and 1,200-candlepower lamp burns pressurized kerosene. Removable 7″ reflector directs light or heat. To convert, lift off burner head and slip on lamp. Height, 11″; base, 5″ by 10″; weight, 4 lb.; fuel capacity, 1 pint; burning time, 7 hours; heat output, 3,500 BTU per hour; price, $29.95. A.W. Thacker Co., Box 528, Clermont, Fla.

Golden Crown Combo C-1. Unpressurized kerosene warms, lights, cooks in this combination unit. Heater flame adjusts itself. Height, 19″; base, 9″ by 11″; weight, 7¾ lb.; fuel capacity, 1.7 gallons; burning time, 35 hours; heat output, 4,400 BTU per hour; price, $29.95. Golden Crown Products Co., 734 May St., Jacksonville, Fla.

Own Campfire



BernzOmatic TX-900A. Radiant heater (center) is part of a propane-fueled camp-appliance system with refrigerator, stove, and lantern. Height, 13″; base, 5½″ by 9″; weight, 10½ lb.; two-cylinder fuel capacity; burning time, 12 hours on each cylinder; heat output, 1,200 BTU per hour; price $29.95. BernzOmatic Corp., 740 Driving Park Ave., Rochester, N.Y.



Adams 3-in-1 Sports Heater 150. Housed in a carrying case, it's an infrared heater; a removable burner serves as a stove; and an optional lantern fits over the burner. Height, 11″; base, 4¾″ by 9½″; weight, 8¼ lb.; one-cylinder fuel capacity; heat output, 4,000 BTU per hour; price, $19.95. Made by Adams Sports Equipment Div., Box 191, Steubenville, Ohio.

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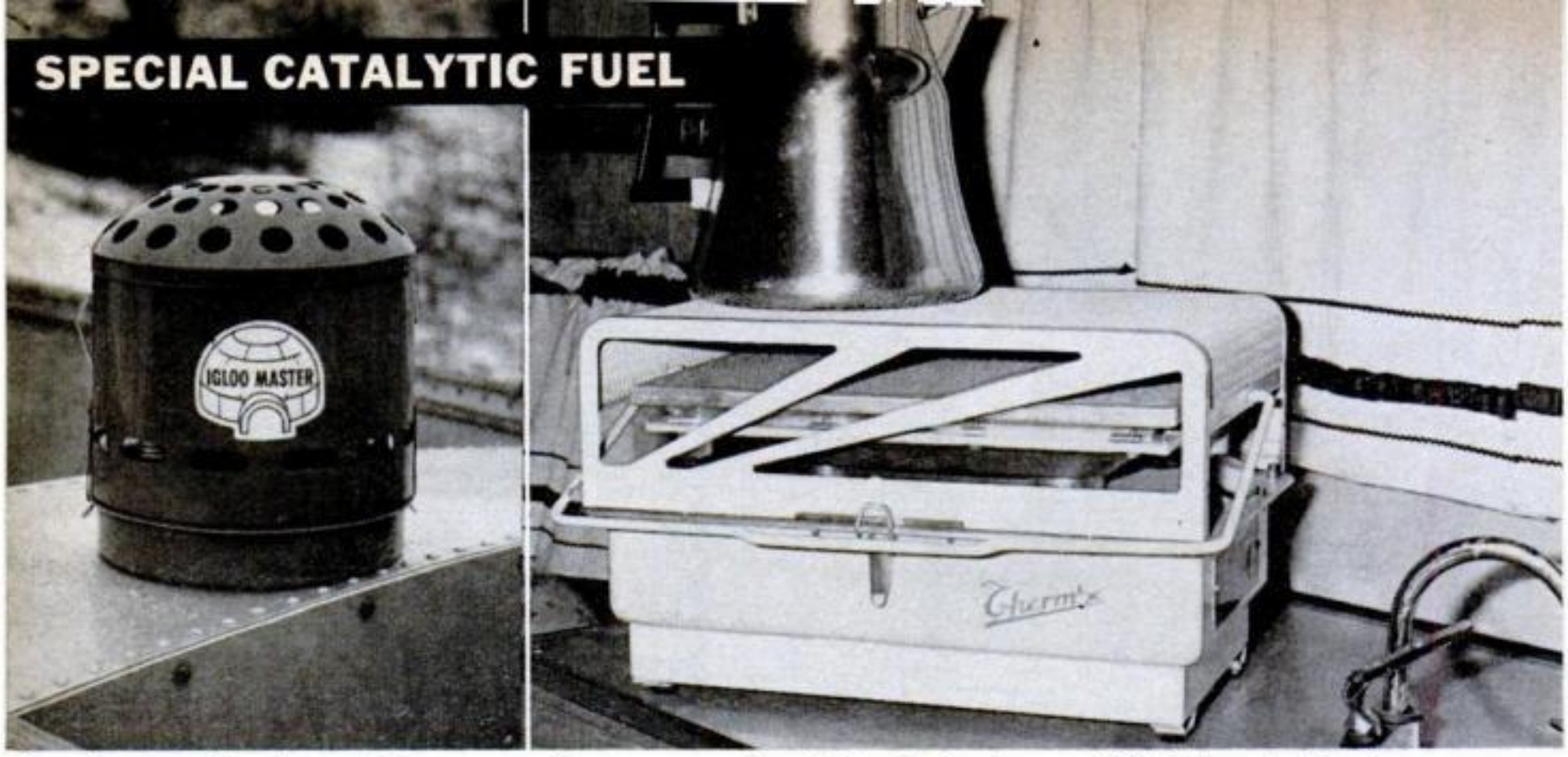
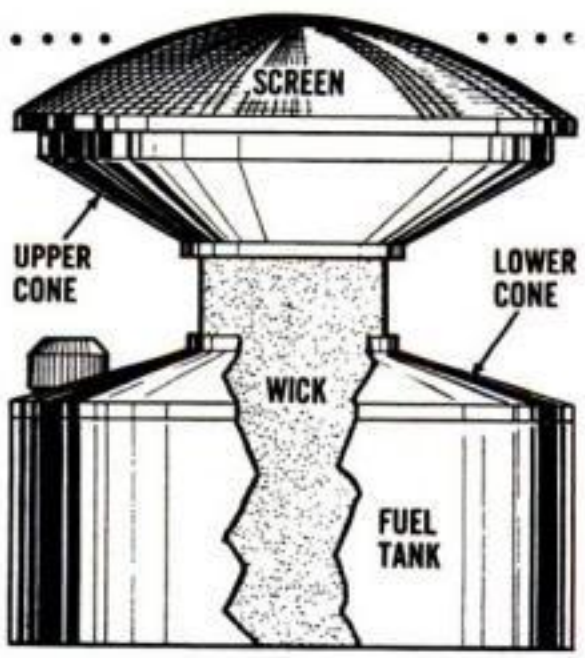


Flameless combustion, 100-percent efficient, is claimed for catalytic heaters. **Black Igloomaster** (left) only heats. Height, 9½"; base, 8" diameter; weight, 3 lb.; fuel capacity, 3 pints; burning time, up to 20 hours; heat output, 2,600 BTU per hour; price, $19.95. Thomas Black and Sons. Box 541, Ogdensburg, N.Y. **Therm'x Explorer 57C** (right) heats, and warms food. Height, 9½"; base, 9½" by 15"; weight, 13 lb.; fuel capacity, 1 gallon; burning time, 28 to 32 hours; heat output, 4,000 BTU per hour; price, $54.95. Therm'x Corp. Inc., 1268 Folsom St., San Francisco.

Fuels can be burned without a flame

Some special fuels will give flameless combustion in the presence of a catalyst. Despite low 700-800-degree combustion temperatures (instead of the 1,200-degrees-plus of an open flame), catalytic combustion burns the fuel completely. This means no carbon monoxide. In drawing at right, special naphtha-based fuel is stored in the cotton-packed tank. It soaks up through the wick and evaporates in the lower and upper cones. Fumes combine with oxygen at the grid, which is made of a catalytic material (usually platinum or nickel), producing flameless heat. The stove is started by burning alcohol on the grid.



Camp heaters and cookers vary widely in cost and performance. For very little money, you can get a tiny hiker's stove; or for nearly as much as equipping a kitchen at home, you can buy mobile appliances that give camping out the comforts of home.

Which should you choose? The big question you'll have to ask yourself is this: What do you want your camp stove-heater unit to do? If you will be bicycling or backpacking, the important consideration is size and weight. If you plan to stay in one place for a while, you need something different from equipment designed for a new camp every night.

The consensus seems to favor LPG (liquefied propane gas) as the handiest and best for pickup campers and travel trailers. For boats, it's not so good. There's the danger of fumes collecting in bilges unless you take special precautions.

Propane in disposable cylinders makes a handy fuel for camp stoves and heaters, but some may consider it expensive at about $1.50 a cylinder. Refillable cylinders can sharply reduce this cost and bulk tanks like those used on camping trailers can knock it down to less than the cost of running a gasoline stove.

Butane is similar to propane, but is not interchangeable as a camping fuel. Butane stoves will not operate below 30 degrees; and the stuff freezes solid at 16 degrees. Propane will work down to about 50 degrees below zero.

For light camping and short stays, alco-

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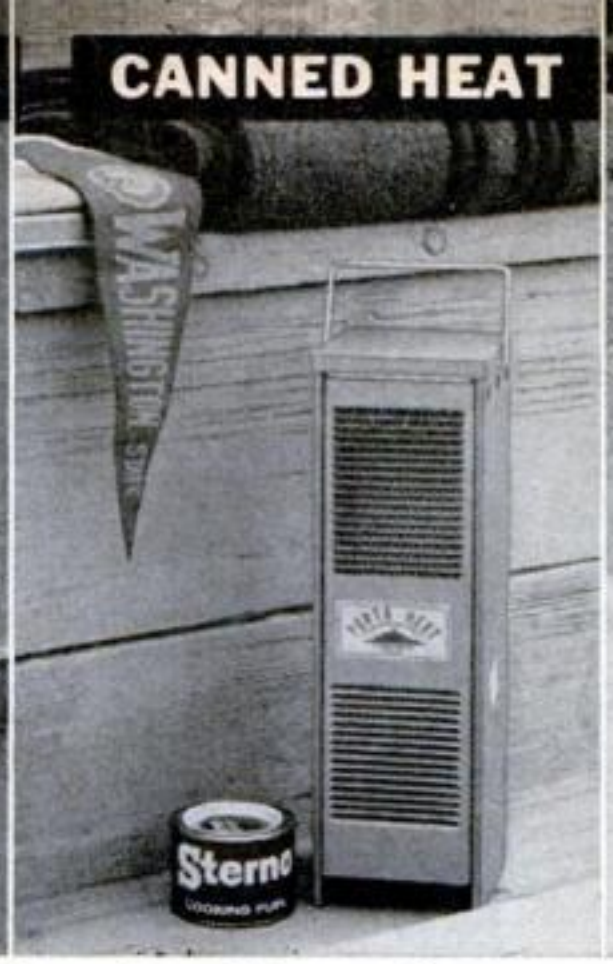
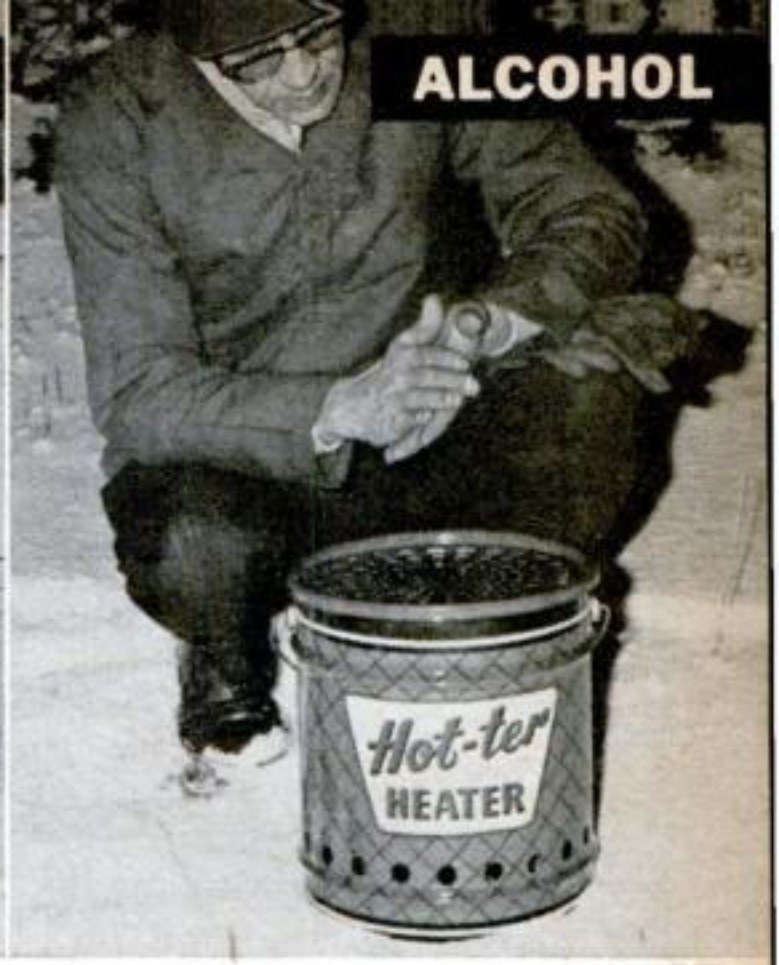
Coleman Sportster stove. Slip-on heat drum turns this gasoline-fired stove into a radiant heater. Two-quart saucepan and a 6″ frypan form its case. Height, 5¾″; base diameter, 5½″; weight, 3 lb.; fuel capacity, 1.6 pints; burning time, 8 hours; heat output, 3,000 BTU per hour; price, $10.95 (case and heat drum extra). Coleman Co., 1250 N. St. Francis St., Wichita, Kan.



Dry Porta-Heat. Aluminum-lined steel case deflects heat from canned heat fuel, and stove lies flat for cooking. It is windproof, smokeless, odorless, and nontoxic. Height, 15″; base, 4½″ by 5″; weight, 3½ lb.; fuel capacity, one 7-ounce can of Sterno; burning time, 1½″ hours; heat output, 4,300 BTU per hour; price, $5.95. Dry Mfg. Co., Inc., Box 797, Winters, Tex.



Seater Hot-ter Heater. Four alcohol-burning wicks operate singly or together for cooking and heating. A control ring regulates the burning rate. Height, 13″; base diameter, 11″; weight 5½ lb.; fuel capacity, 1 pint per burner (total 4 pints); burning time, 6 to 15 hours; heat output, 4,000 BTU per hour; price, $12.95. Seater Heater, Inc., Box 4008, Rockford, Ill.

hol is a favored fuel. It costs a bit more than kerosene or gasoline, but it is easier to carry, less apt to cause odors in clothing or gear, and stoves for it are often more compact and lighter.

Gasoline or kerosene are more popular for longer stays because they cost quite a bit less than alcohol or propane.

Many uses. Unlike most other camping equipment, a heater-stove need not be merely a gadget, for use only once or twice a year. If you are a car tinkerer, a radiant heater will make winter work more accurate and more fun. Also, your wife can use many models to speed defrosting the refrigerator or freezer. And, in case your car should get caught in a blizzard, one of the catalytic heaters could keep you warm and save you from asphyxiation by exhaust fumes from a running engine.

Meanwhile, back at the campsite, the new heater-cookers do things campfires never did. Use one to warm your sleeping bag before turning in for the night. Then fire it up in the morning and make a hot breakfast.

Consider all the possible uses, and then start looking. The variety around should provide one that perfectly suits you. ■ ■

Raemco 7-in-1 stove. Wood, coal, coke, charcoal briquets, or other solid fuels cook, bake, smoke, or broil and space-heat in this stove. Basic stove includes steel firebox, folding legs, lid, handle, grill, grate, draft door, and damper. Height, 11½″; base, 10¼″ by 21¼″; weight, 27 lb.; price, $24.50; many optional extras. It's made by Raemco, Inc., Box 482, Somerville, N.J.

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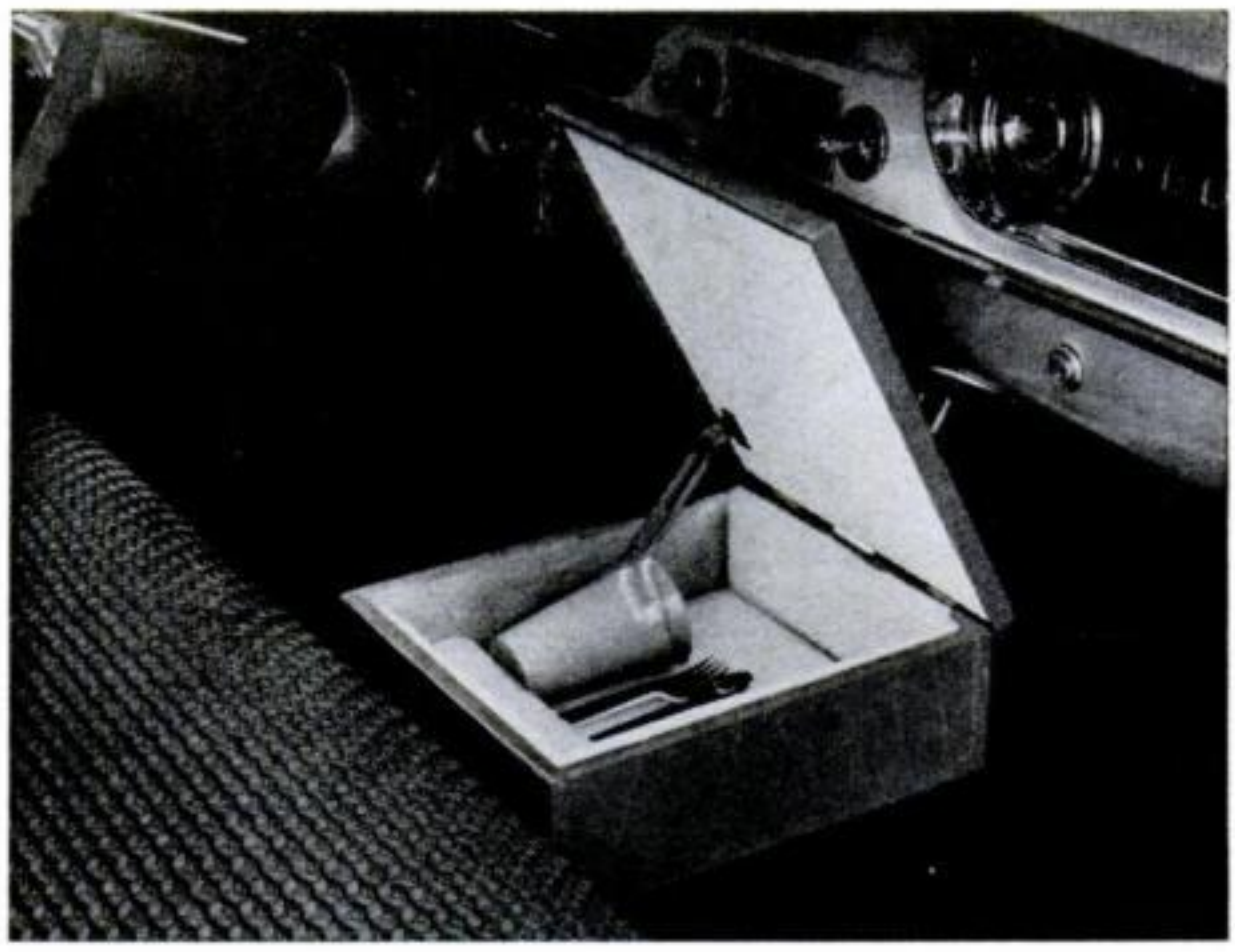
6 Slick Tips for

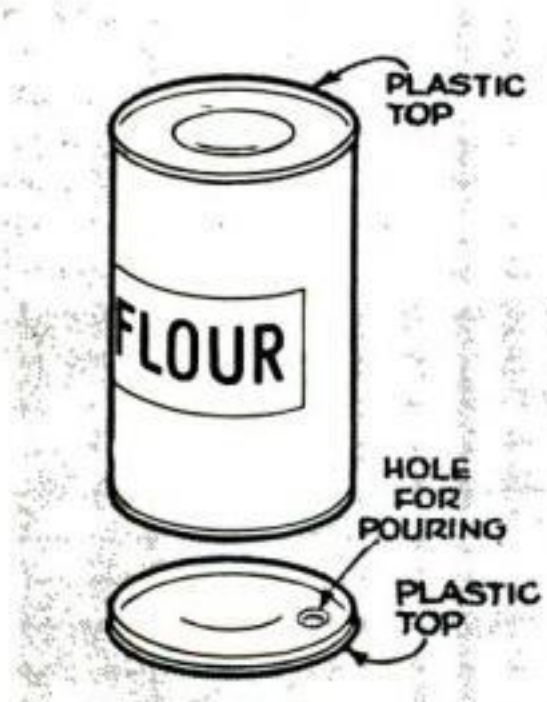
1 Console box has a good grip on car floor

This console box rides solidly on the transmission hump of my car ahead of the front seat because of its unusual construction—legs that straddle the hump and two protectors that cling to the floor carpet. The box is ½" plywood with ¾" trim around the lid. During roadside stops it makes a handy flat surface for cups, plates, and other items carried inside when not in use. On a vacation trip, the box is a handy place for all sorts of items you want close at hand. Mine is lined with foam rubber so it can carry a tape recorder without damage.—*W. B. Sill, NYC.*



2 Carry supplies in plastic-capped cans

Those one-pound coffee cans with plastic covers are ideal for carrying camping supplies such as flour, cornmeal, or powdered detergent. You need two caps for each container. Cut a hole in the spare cover for easy pouring. carry it on the bottom of the can. switch to the top for use. Label the contents of all the cans with felt-tip markers.—*Alvin G. Brown, Galena, Kan.*

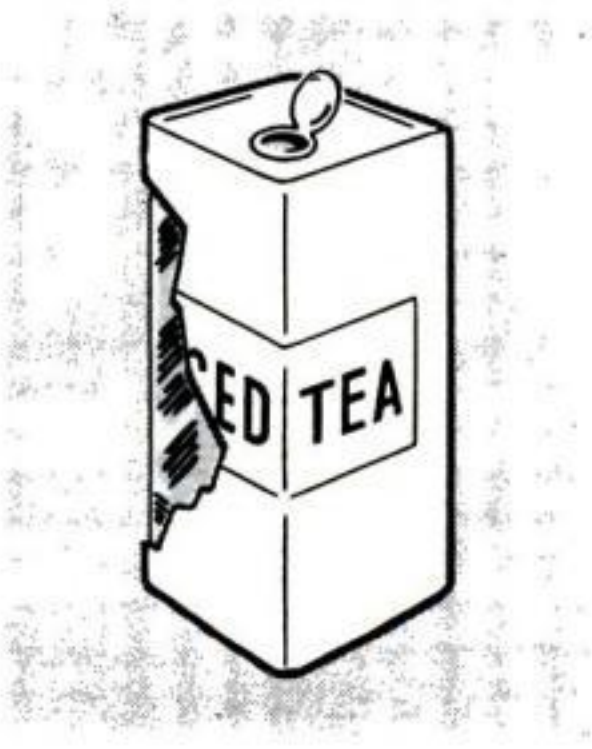


3 How to ride in comfort in a canoe

A simple canoe seat and backrest, the type used by Quebec guides, is more comfortable and safer than the standard high seat since it lowers the center of gravity, making the canoe less likely to tip. Two logs about 3" in diameter and 18" long form the base, scrap-wood pieces about 16" long the seat. The backrest can be bought or made from scrap wood.—*Walter E. Baker, Glens Falls, N.Y.*

4 Freeze your drinks in milk cartons

Our family now enjoys cool drinks throughout a full weekend outdoors, even though we travel miles from an ice supply. The trick: freezing the desired drinks in milk cartons before we leave home, and carrying them in our camp cold chest. We have found this successful for a variety of liquids—water, iced tea, fresh milk, and home-mixed milk drinks.—*W. S. Head, El Cajon, Calif.*



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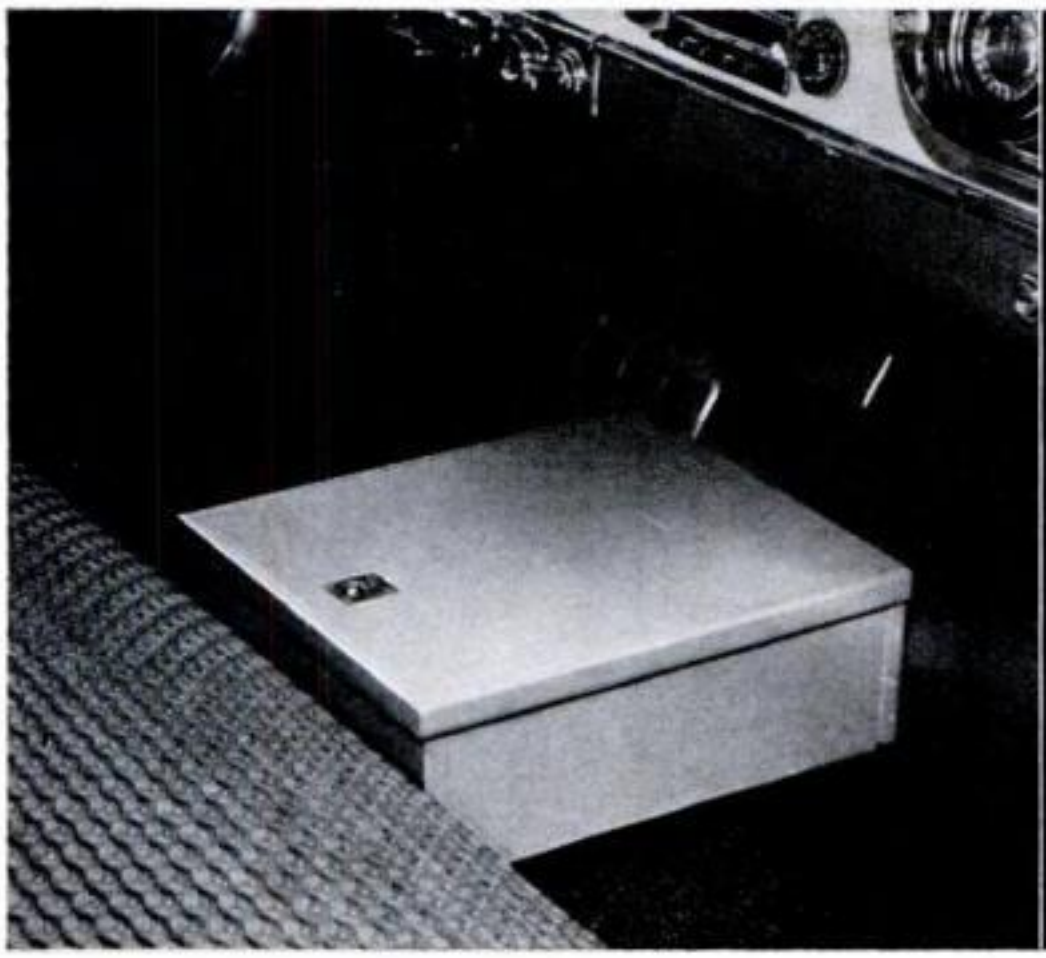
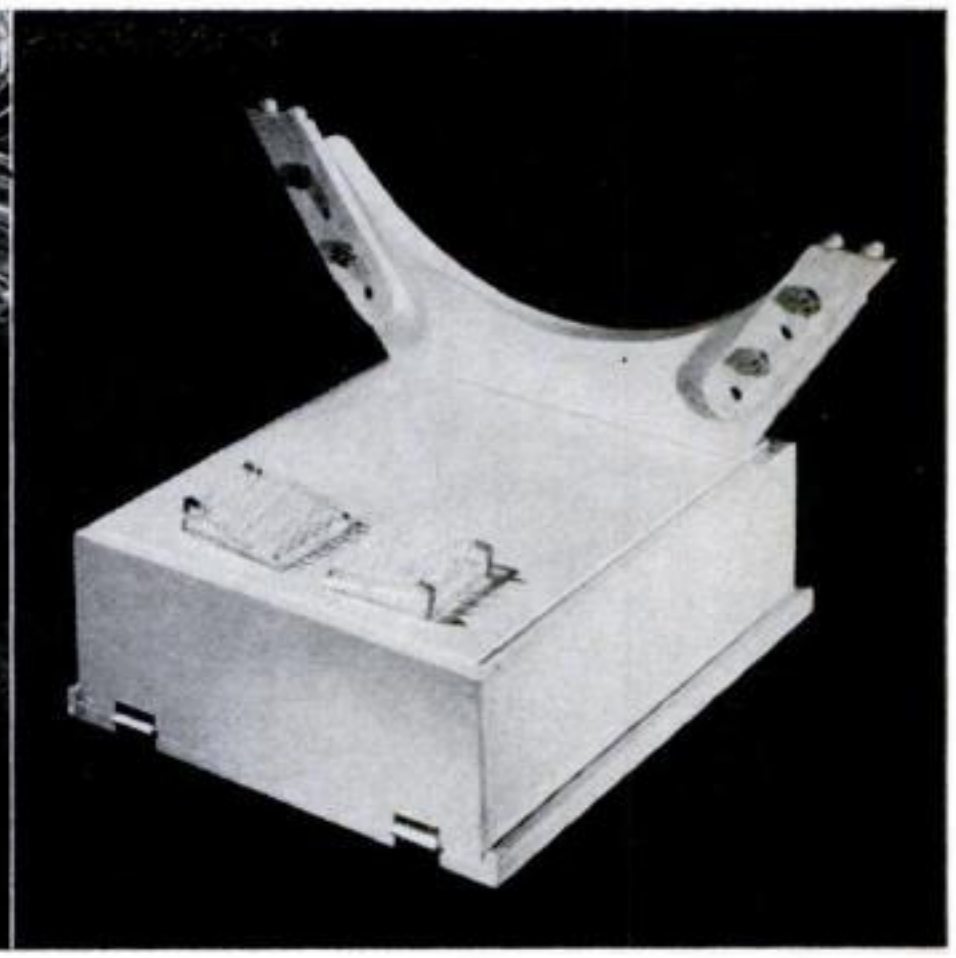
Vacation Trips



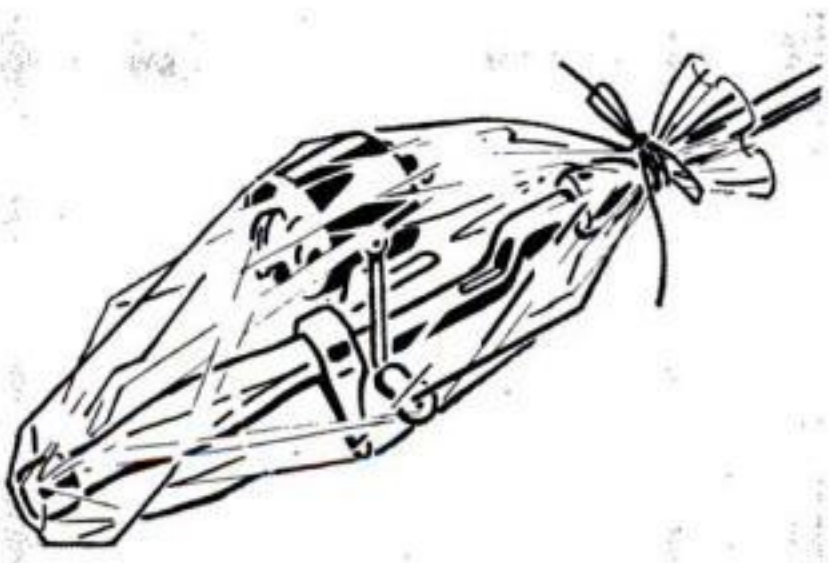


5 Plastic bags protect fishing reels

Since space is always at a premium in your car and tent on camping trips, slipping the handles and reels of fishing rods into plastic freezer bags (below) makes it possible to carry them outside the car or store them outside the tent without damage.—*A. Weber, Edmonton, Canada.*

6 A handy tip for trailer campers

Magnetic catches (below) mounted on the ceiling of a trailer or pickup camper will hold overhead cabinet doors out of the way, freeing your hands for the items you're removing or placing in the cabinet. The catches are available at most hardware stores.—*J. Peretti, Cheyenne, Wyo.*



Need advice about camping? Get it from a free booklet

Planning a car vacation trip this summer? Or perhaps you'd like to plunge deep into the wilds. You can get a variety of helpful tips—in making your preparations and living en route—from a 60-page vacation booklet available free from Dept. S-6, Coleman Co., Wichita, Kan., or from any of its local dealers.

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PS YARD TOOLS

How to Buy the Right Ladder

Wood or metal? Extension or stepladder? And what about safety? Here's straight talk to help you

By Phil McCafferty

BUYING a ladder calls for good judgment. Making do with the wrong ladder can steal any pleasure you may get from home-maintenance jobs—besides making some of them impossible or downright dangerous.

What is the right ladder for you? That depends on a number of things—the size and type of house you live in, whether you have trees, how often you get involved in repair and upkeep. Even how big you are is a consideration. If you are tall, you may get by with a shorter ladder. If you weigh much over 180 pounds, you should consider a top-quality heavy-duty ladder.

All types of home ladders are available in wood or aluminum, with a more limited selection in magnesium and fiberglass. Because a ladder should last a lifetime and your safety depends on it, buy a good one. As a basic quality rule, be sure the ladder you buy bears an approval sticker from either the American Standards Association or Underwriters Labs. Such an okay indicates that it meets or exceeds minimum material and safety standards.

Before you buy, consider how often and for what jobs you use a ladder. Then evaluate the features of each type—ranch, extension, combination, step.

Ranch ladders. These are single, one-piece ladders, so called because they are most useful around ranch-style homes. They are fine for flat, hip, or low-pitched one-story houses with little roof overhang.

There's a hooker in the overhang situa-

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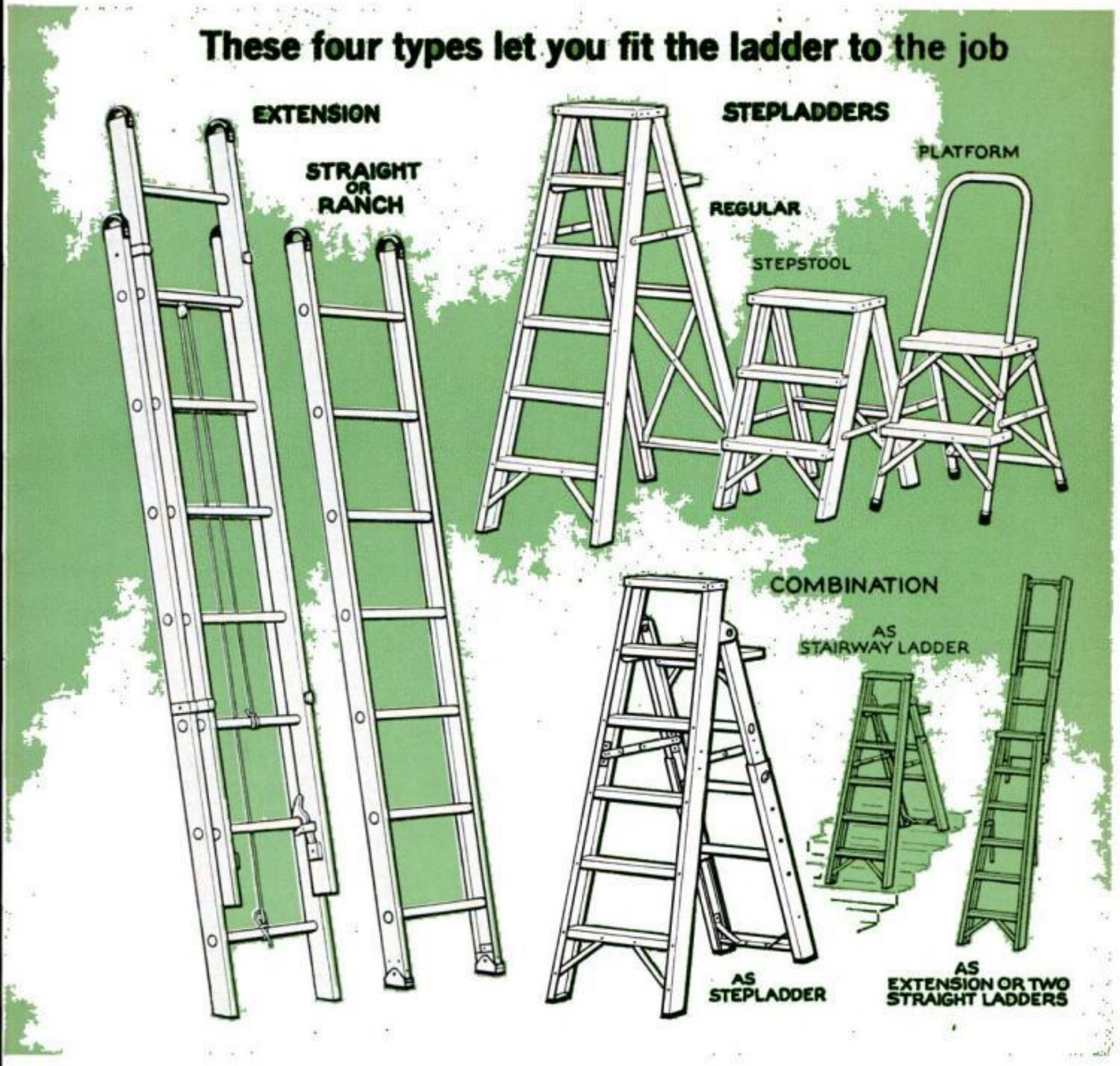

tion, however. If you get a ladder long enough to get you on the roof, it won't safely go under the soffit. With a wide overhang, resting the ladder on the eave may put it too far away from the side of the house for safe and effective work. But if you merely want to get on the roof, a single may be your choice even for a two-story house.

Extension ladders. These are two single ladders hooked together. One section slides along the other; latches lock the extended section in one-foot steps, and raising and lowering is eased with a rope and pulley.

Most two-story houses make this type of ladder almost a must for painting and repairs. Retracted to 8′ length, a 16′ (the shortest generally offered) extension ladder gets you close to low painting and scraping work. Extended a rung at a time, it reaches to the gables in convenient working steps. Adjusted to a height above the eaves, it can put you safely on the roof. Take it apart and it makes two ladders for doubling up on low work.

Combination ladders. At first glance, this looks like a stepladder, but it could be the answer to all your ladder needs. There are variations, but basically the rear rails have rungs, which means that when used as a stepladder two people can work on it at the same time. The rear unit extends on the front to make a pretty fair extension ladder. Or you can remove the rear unit and have two straight ladders.

Combination ladders come in wood, alum-

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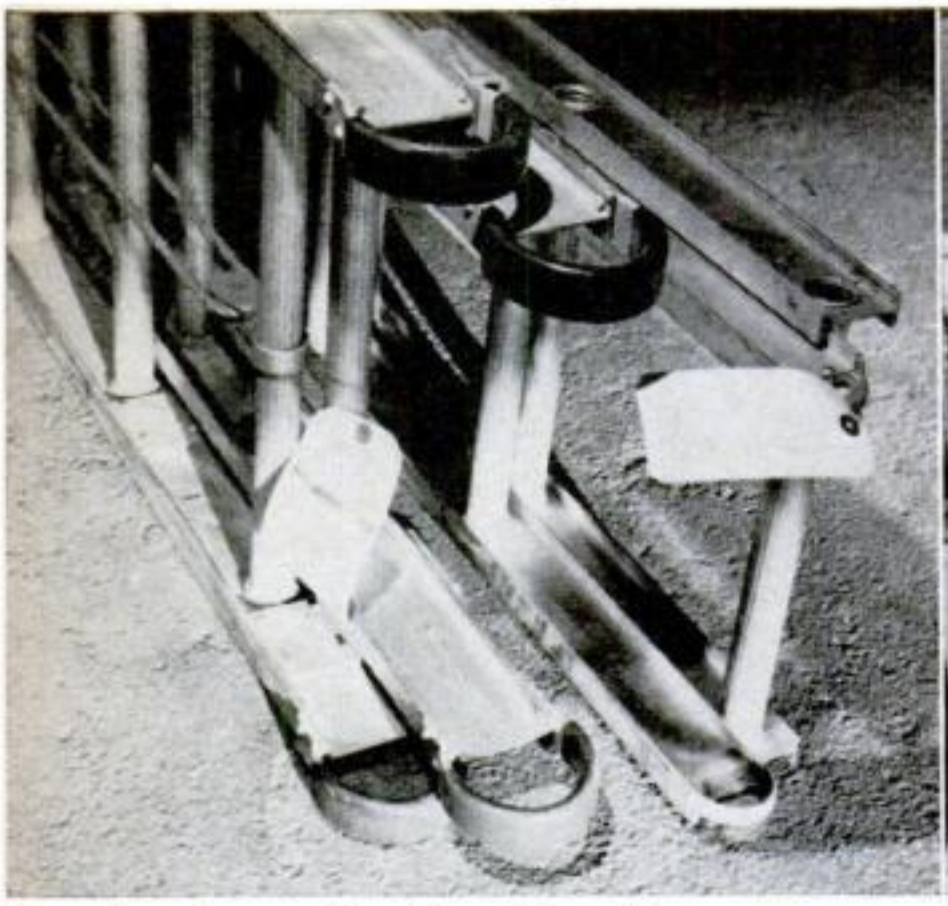
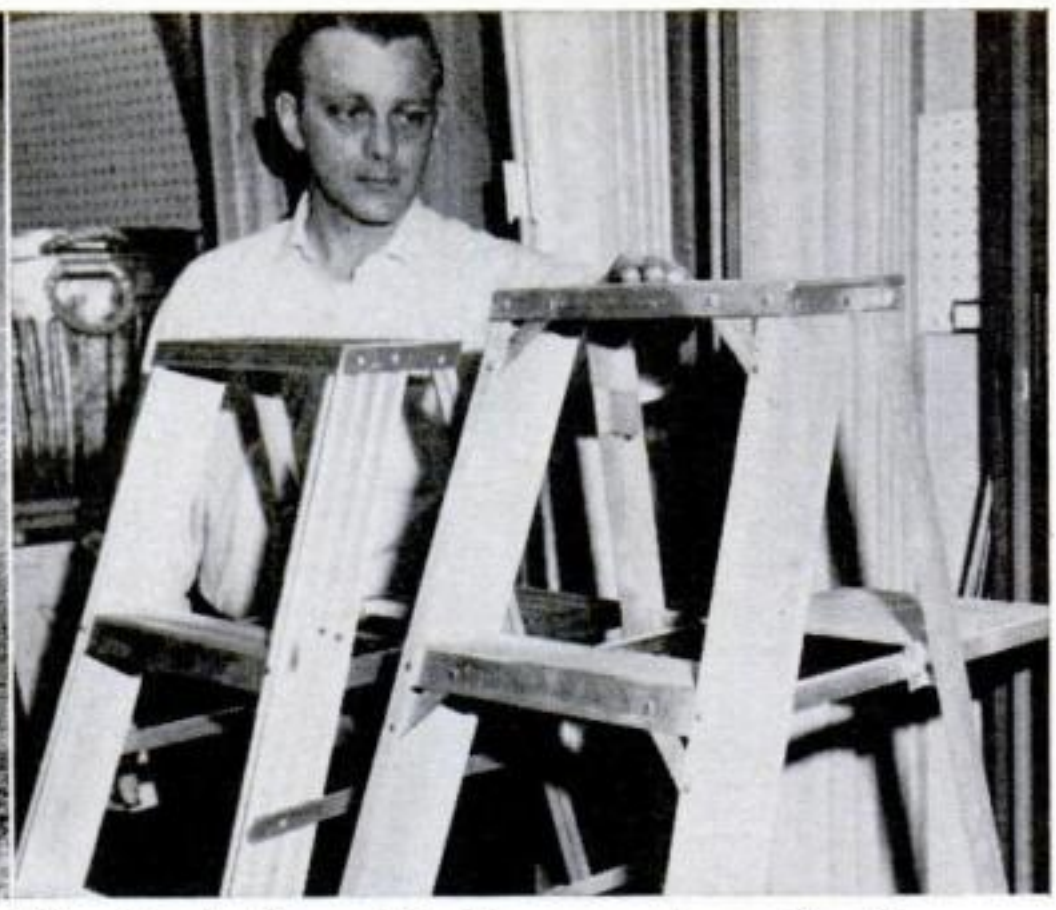
Safety and durability depend on quality. Before you buy,



For clues to quality of metal ladders, compare their width and rail sizes. Sizes of rungs also vary. Note difference in size and covers of protective bumpers on the two ladders above.



Skimping is often evident by comparison. The 5′ ladders above are not even same height. The budget ladder at left lacks shelf bracing and its spreader brace is higher than that of the other.

inum, and magnesium. A 6′ unit is equivalent to a similar 6′ stepladder, and extends to 10′. One firm sells a good 6′ stepladder for $25, a combination for $32. Be sure you can compromise on a size that is short enough as an indoor stepladder, yet tall enough as an outdoor extension.

Stepladders. You'll find these handy in dozens of ways, and unless you choose the combination, you'll probably want one for inside work. Outside use is often dangerous because of uneven ground conditions.

An interesting variation is the platform ladder, which has a wide platform for your feet and a grab rail at the top. A wide paint platform on some models makes this type excellent for paint-rolling jobs.

Stepstools are short stepladders, two to three feet high. Small, light, and handy, they make a wise choice for those frequent jobs that are just above tiptoe reach.

Wood or metal? Time was when a ladder was wood. Today wood is being challenged by metal and, to a certain extent, by fiberglass. Wood ladders are heavy and subject to splinters and to paint splatters that won't wipe off. A long wood extension ladder is not easy to extend or lower. Leave a wood ladder outside and it will rot.

But they have a solid, comforting feel that is hard to match with any but the most expensive metal ladders. A wood ladder can split and fail, but impending failure is usually obvious by sight or sound.

Wood ladders—the rails are usually hemlock or spruce, the rungs hickory—used to be the cheapest you could buy. Now you can buy a budget aluminum ladder for about the same price as a wood ladder without tie rods, a medium-quality aluminum ladder for about 10 percent more than top-quality wood.

Aluminum ladders weigh just about half as much as wood. This lightness can be worthwhile when you must move the ladder many times a day, or if your wife uses it. Extensions go up and down like a breeze.

You'll find a wide range of aluminum ladders on the market. The cheapest are pretty flimsy, and mistreatment can bend their components out of shape.

Magnesium metal weighs only two-thirds as much as aluminum, yet most magnesium ladders weigh just about the same as aluminum. The reason: They are generally made of thicker, wider extrusions. So pound for pound, a magnesium ladder is likely to be huskier and less springy than aluminum.

In price, magnesium ladders are in the same range as medium- to top-quality aluminum ladders, which makes them more costly than top-quality wood.

Brushed against a power line, a metal ladder can give you the equivalent of a trip to the electric chair, and warning labels

[*Continued on page 180*]

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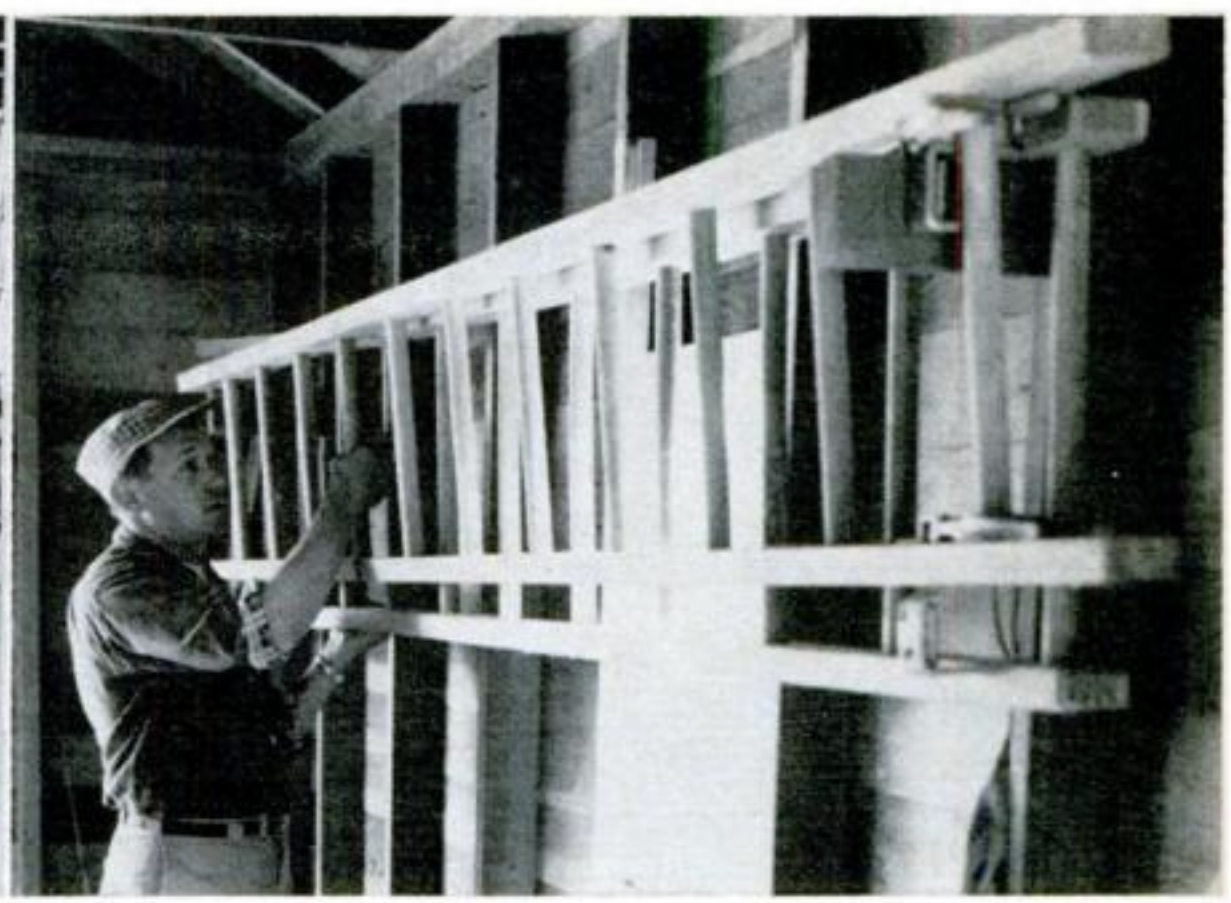
compare sturdiness, bracing, and the convenience features



Rigidity and stability of a stepladder can be checked by throwing your weight on one end of a step—as you might in use.

The problem of storing your ladder should be considered before you make a choice. Wooden ladders should be kept out of the weather to avoid rot. If your garage is as crowded as the one above, a metal ladder, storable outside, may be a better choice.

HOW MUCH LADDER DO YOU NEED?

	NOMINAL LENGTH (ft.)	USUAL OVERLAP (ft.)	EFFECTIVE LENGTH (ft.)	TYPICAL WEIGHTS (lb.) Wood	TYPICAL WEIGHTS (lb.) Metal	TYPICAL PRICES Wood	TYPICAL PRICES Metal
SINGLE	8	—	8	16 - 18	8 - 9	$8 - 10	$8 - 10
	10	—	10	22 - 24	10 - 12	9 - 12	9 - 12
	12	—	12	23 - 30	12 - 14	10 - 14	11 - 15
	14	—	14	28 - 33	14 - 17	13 - 17	14 - 18
EXTENSION	16	3	13	24 - 36	15 - 22	12 - 18	14 - 37
	20	3	17	45 - 51	20 - 28	19 - 27	19 - 47
	24	3	21	55 - 60	25 - 33	24 - 32	23 - 55
	28	3	25	62 - 70	38 - 50	33 - 40	33 - 66
STEP	4	—	2½	10 - 15	6 - 10	4 - 6	9 - 12
	6	—	4	15 - 25	8 - 19	5 - 9	12 - 29
	8	—	6	25 - 35	16 - 26	10 - 12	18 - 40
COMBINATION	6	2	10	28 - 35	15 - 23	13 - 16	25 - 33
	8	2	14	38 - 42	20 - 28	17 - 22	35 - 45

As a safety measure, top two steps of stepladder should not be used either for climbing or standing. Your reach, plus this effective length, gives size of stepladder you should buy.

For top-of-the-house work, a ladder must extend at least 2' above the eaves line if you are to climb up and down with confidence and safety. And be sure the ladder has good footing.

A ladder that's too long to go under a wide roof overhang is not the right one for painting or other work on the side of the house. As the sketch shows, you're too far away.

Urheberrechtlich geschütztes Material

The transceiver lineup: battery-powered, hand-held sets; rugged mobile rigs; sophisticated

Getting the Most

Set up your own low cost two-way radio system—

By Ronald M. Benrey

Nearly one million Americans can't be wrong. They are the holders of Citizens Band radio licenses who use the 23 CB channels for innumerable types of business and personal communications. Any U.S. citizen over the age of 18 is eligible for a CB license. To apply, just fill out an application form and pay an $8 fee to the Federal Communications Commission—there aren't any exams, and no technical knowledge is required.

In addition to licensed CBers, there are countless others who own and use license-free CB walkie-talkies. These low-power transceivers—maximum allowed transmitter power is 1/10 watt—are perfect for short-range communications (up to ¾ mile over average terrain). But bear the following point in mind:

If a walkie-talkie is used to communicate with a licensed CB set, the walkie-talkie must also be licensed. Its user must be over 18 and obey all the full-power CB rules and regulations.

The new rules. To provide room for more stations on the crowded Citizens Band, the Federal Communications Commission issued a new set of rules that went into effect on April 26, 1965. The most important changes: The use of CB radio as a hobby or for "hamming"—never given official sanction—is now prohibited. Communications between units belonging to different licensees is now restricted to Channels 9 through 14 and Channel 23. The other 16 channels are reserved for you to

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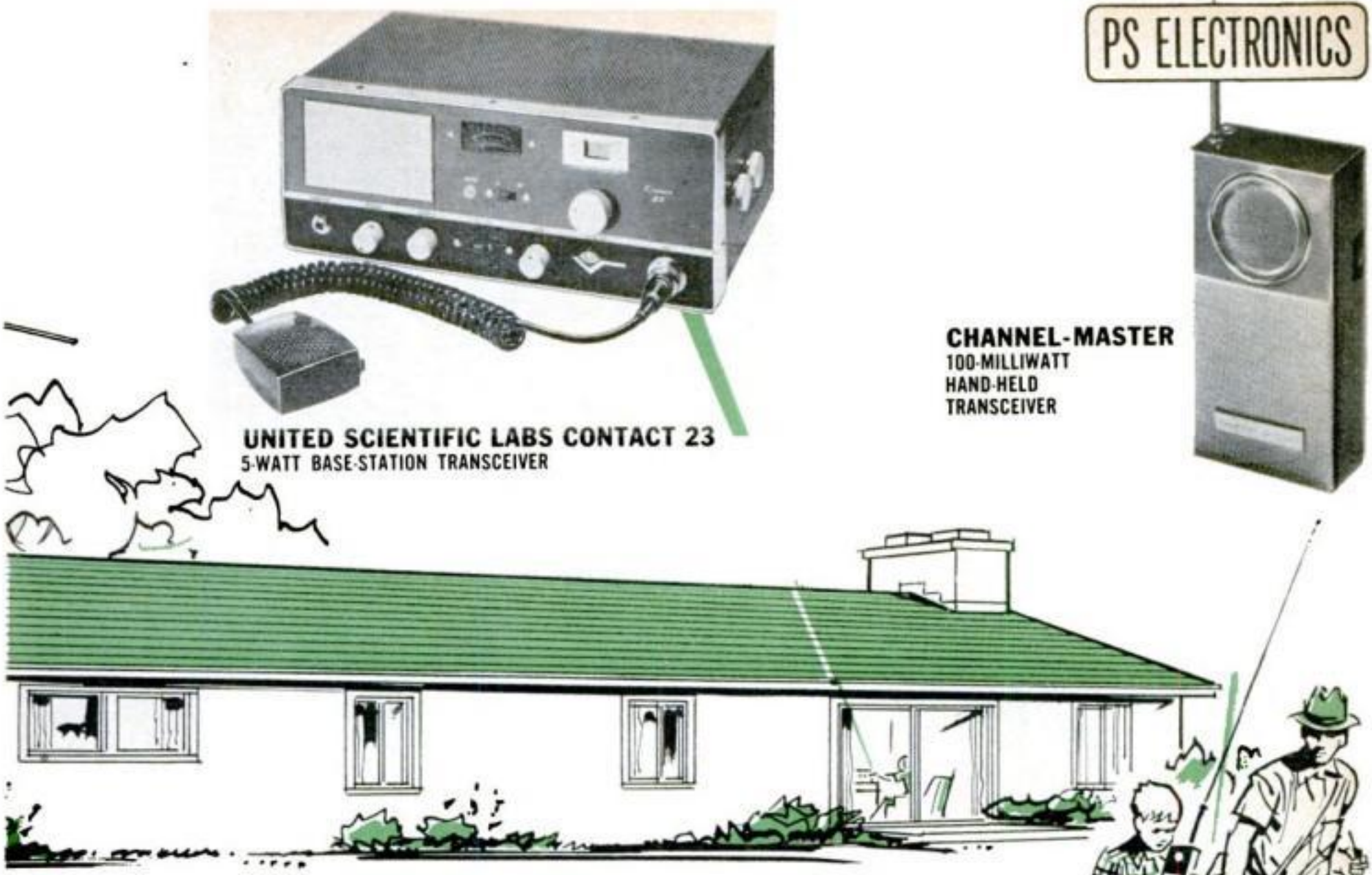

long-range base-station units; and the ubiquitous no-license walkie-talkie

Out of CB Radio

new rules and equipment make it easier than ever

communicate with other units in your own private two-way system, say between your home and car.

Although some observers question the ability of the FCC to enforce the new rules, the rules seem to go a long way toward keeping the CB channels open for legitimate, necessary communications.

One way to beat the interference on the crowded CB channels and extend operating range while you are at it, is to do your CB-ing with one of the brand-new "third generation" CB transceivers. These super-rigs are much more effective in slicing through clutter than the "first generation" sets of six years ago. The new sets don't push more than the legal five watts of power into their transmitters. Their secrets are highly sophisticated receiver design and "talk-power" boosting circuitry in the transmitter. For example:

- Triple-conversion receivers—the circuitry resembles three ordinary superheterodyne receivers connected in a chain. The result is greatly enhanced selectivity—the receiver's ability to ignore an interfering signal of a frequency close to the one you want to listen to.
- Mechanical filter—it also boosts selectivity. It is a stack of precisely cut metal disks, loosely linked together by a slender rod. A transducer—similar to a loudspeaker—transforms the receiver's IF signals into mechanical vibration and feeds it into one end of the stack. Another transducer at the other end—this one similar to a microphone—picks up any vibrations that pass through the stack. Each disk acts like a tuning fork

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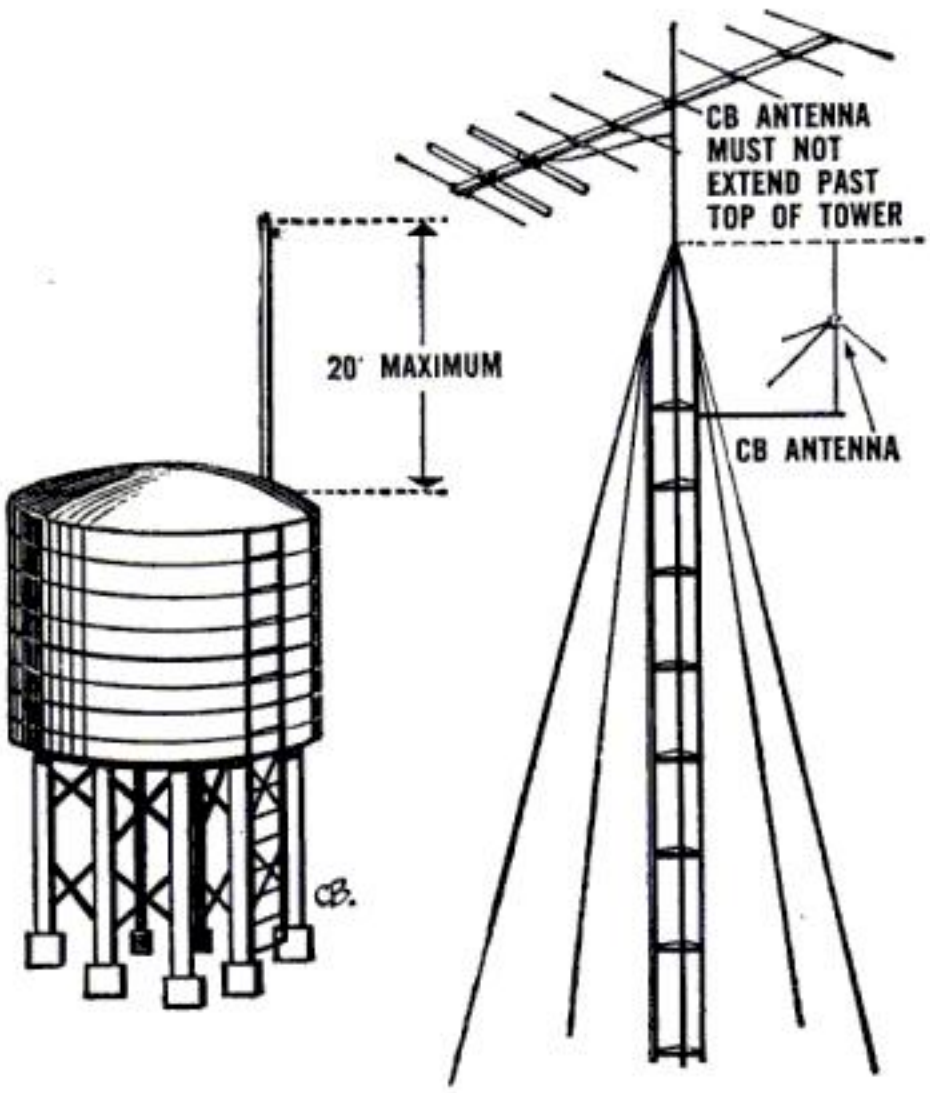
Is your antenna legal?



A CB antenna must not add more than 20 feet to the height of any man-made structure it's mounted on. If mounted on a TV antenna tower, it must not protrude past the tower's top.

–it vibrates at a single frequency. Only dead-on-frequency vibrations–the precise frequency you're tuned to–can run the gauntlet and pass from disk to disk through the complete stack.

● Frequency synthesis–it gives stability of switch-selected crystal-controlled reception and transmission on all 23 channels, without the expense of 46 individual crystals (a transmit-and-receive crystal for each channel). A synthesizer network generates the 46 different required oscillator outputs by blending the signals from only eight to 10 different crystals.

● Talk-power boosters–the most popular is the speech compressor. It makes the signal seem stronger on the receiving end of a conversation by cramming more intelligibility into it at the transmitter. Here's how:

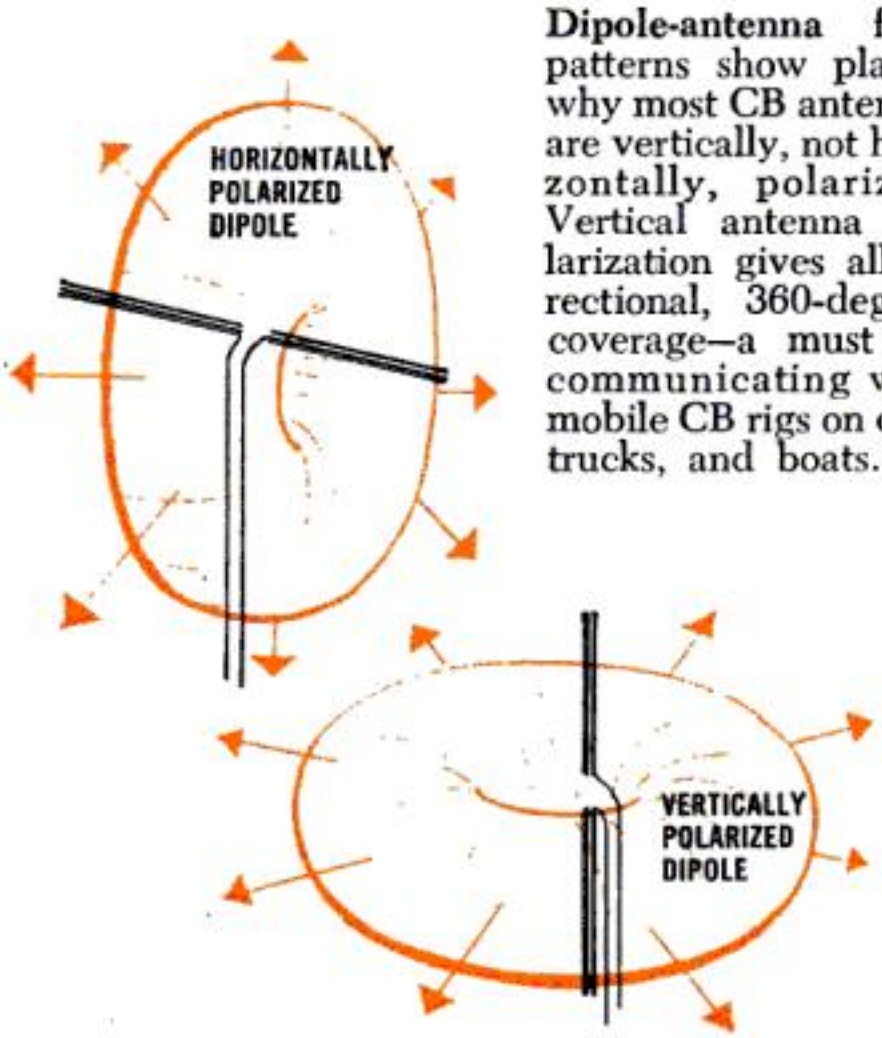
Only the modulated portion of a CB transmission comes out of the receiver's loudspeaker. It's the fraction of the signal that actually carries a voice. For maximum range, and clutter penetration, the transmitted signal should be 100-percent modulated–all of its power should carry voice. There's a catch, though. The human voice constantly changes volume as it speaks–in the word "stop," for example, the "p" is a loud sound, while the "s" is soft. To prevent overmodulation that distorts transmission (and is forbidden by the FCC) most CB rigs are adjusted so that loud sounds modulate the signal 100 percent. However, speech is mostly soft sound, and the average modulation is usually an inefficient 30 percent.

The solution is a speech compressor–an automatic volume control connected to the transmitter's modulator. It boosts the level of soft sounds, clips the level of loud sounds. The result is a higher average modulation–about 60 percent–and, consequently, a stronger received signal. A compressor-equipped transmitter often sounds –at the receiver, where it counts–twice as powerful as an ordinary set. Speech compressors are also available as plug-in accessories for older transceivers.

● Selective calling. This can't eliminate interference, but it does make CB-ing on crowded channels a lot more pleasant. The selective call unit keeps a CB rig's receiver silent until it detects a transmission meant for that particular receiver. How can it tell the difference? By listening for an audio tone of specific frequency that is transmitted, just before the voice message, by an identical selective call unit on the distant transmitter.

Mobile CB installations. Rigs mounted in cars, trucks, and boats are often plagued by a different kind of interference: ignition and electrical-system noise. These both lower the effective sensitivity of the receiver,

What about antenna polarization?



Dipole-antenna fixed patterns show plainly why most CB antennas are vertically, not horizontally, polarized. Vertical antenna polarization gives all-directional, 360-degree, coverage–a must for communicating with mobile CB rigs on cars, trucks, and boats.

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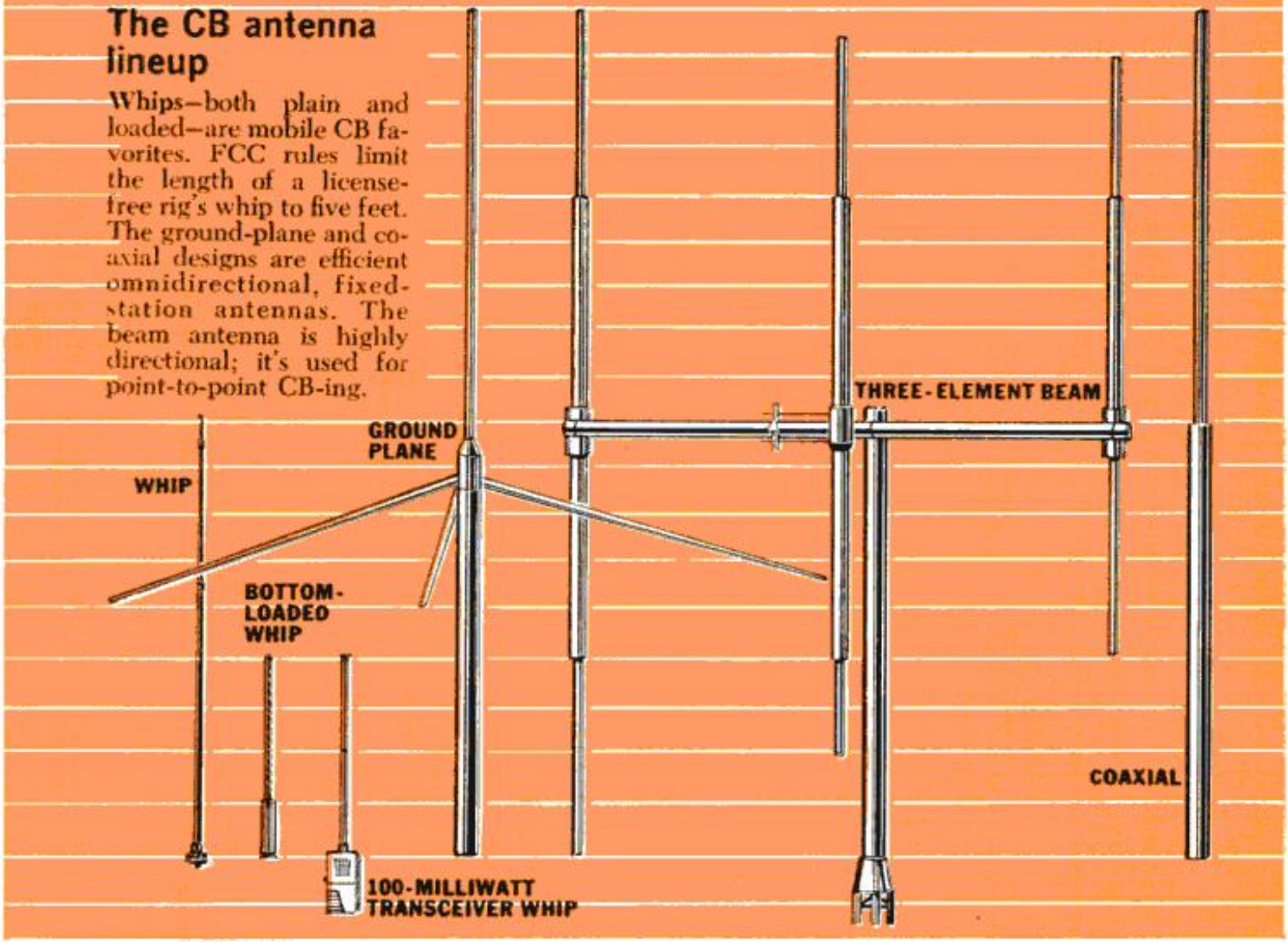
The CB antenna lineup

Whips—both plain and loaded—are mobile CB favorites. FCC rules limit the length of a license-free rig's whip to five feet. The ground-plane and coaxial designs are efficient omnidirectional, fixed-station antennas. The beam antenna is highly directional; it's used for point-to-point CB-ing.



since an incoming signal must be much stronger than the noise for it to be received. The only sure cure is to shield a vehicle's ignition system to prevent noise radiation, and to add filters that isolate the CB gear from the electrical system. Unfortunately, shielding may reduce engine performance.

Very sensitive mobile rigs often sound like popcorn makers. The crackle is caused by static electricity building up on rolling tires and randomly discharging to the chassis. This happens because the wheels are electrically insulated from the chassis by the thin grease film in the wheel bearings. The cure is simple: a coil spring that fits around the wheel spindle and short-circuits the wheels to the chassis.

Car-mounted CB sets are due for a sudden popularity spurt, especially among people who travel away from home. The reason is FCC approval of the use of mobile CB to call for emergency roadside assistance, and to ask CBers along the way about the best routes and food and lodging stops.

The Automobile Manufacturers Association recently proposed that CB gear be installed in all new cars, and a network of monitor stations be set up to handle calls for roadside assistance. Their proposal is called HELP—for Highway Emergency Locating Plan.

Hand-held sets. The easiest way to take CB radio along on your vacation this summer is to slip one of the high-power carry-around transceivers into your glove compartment. The lowest-cost models—one- or two-watt hand-held sets—are the big brothers of the license-free walkie-talkies. At the other end of the price scale are the most expensive CB transceivers made—full five-watt battery-powered all-transistor units.

Over average terrain, the carry-arounds have a reliable range of three to five miles; over water, they will reach about 10 miles.

Many CBers have the mistaken notion that a high-power transmitter and a sensitive receiver will cancel out a poor antenna. It's really the other way around.

The antenna is a transceiver's window; if it's shut, incoming signals can't reach the receiver, and outgoing signals can't leave

[*Continued on page 207*]

A big sedan rolled in from the parkway, steam swirling from under the radiator. "Don't go away!" yelled the driver.

Gus Stops a Runaway

Gus wasn't a cop or a psychiatrist, but he knew right away that the teen-age couple had a worse problem than a stalled engine

LOOKOUT Number Two was, as the voice on the phone had said, about seven miles south. Gus Wilson swung his Model Garage tow truck off the scenic parkway where rustic buildings housed a snack shop, phone booths, and rest rooms. A parking area afforded a fine view of the river.

Only four cars were there this weekday forenoon. Stopping behind a 1964 Oldsmobile, Gus got out. The car was occupied by a disconsolate-looking teen-age girl, and a heavy Watusi beat came from the radio. A dark-haired youth suddenly appeared from behind the upswung hood.

"Gee, am I glad you got here. There's gas—you can smell it—but no spark." He broke off to look anxiously toward the parkway exit. "We're in an awful hurry."

There was a faint odor of raw gas. Gus lifted off the distributor cap and, by shorting the starter terminals, turned the

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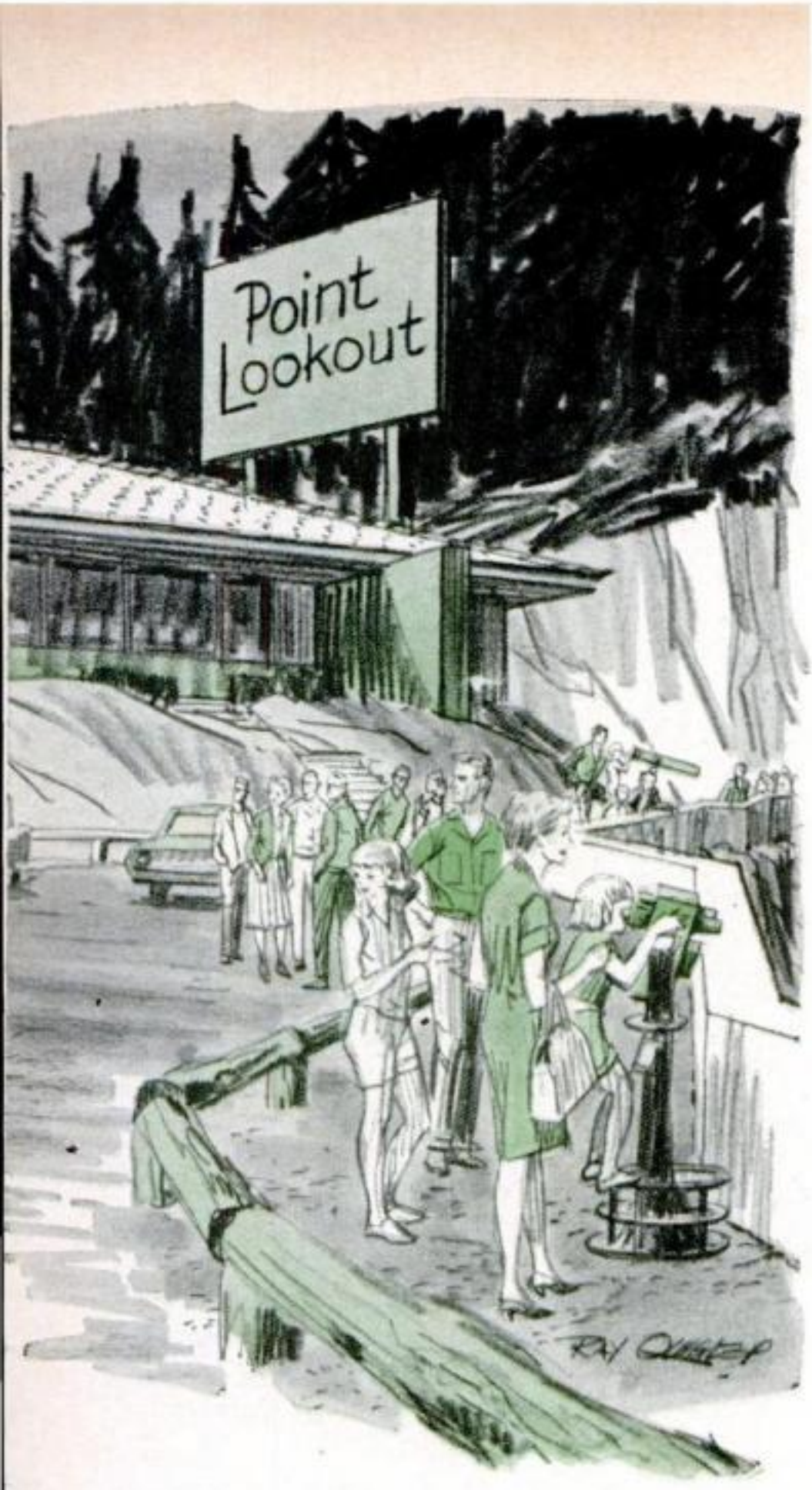

Car

By Martin Bunn

engine over to close the ignition points. Removing the main high-voltage cable from the center tower of the distributor, he placed its end near the distributor rim.

Then he walked around to turn on the ignition. To his surprise, it was already on. The girl stared at him bleakly. Gus returned to the engine and, with a screwdriver, repeatedly flicked the movable ignition point away from the other.

No spark resulted, either between the points or at the cable end. Again Gus turned the engine over, this time leaving the points open. Pressing the screwdriver against the movable point arm, he scratched the distributor plate with the bit end.

Small yellow sparks flashed. White fire crackled between the end of the cable and the distributor rim. Gus shut off the ignition, turning the key to the accessory position so that the radio kept playing. Then he removed the points. Their contact surfaces were a steely blue.

"Your points are burned," he said.

An exclamation escaped the young man. "That's the fourth time on this car—wouldn't it have to happen just when we're . . ." He stopped, and once more scanned the exits uneasily.

"It happened," said Gus, "because the key was left in the run position to play the radio. Do that long enough with the engine not running, and the points are sure to burn."

The boy groaned. "She must have done that while I was getting us something to eat on the road. She always does that, but this time I never noticed. Too excited . . ."

His voice trailed off. It seemed even younger when he spoke again. "Can you put in new points? We've got to get away . . ."

Gus shook his head. "I don't carry points for every car on the road. What're you running from, son? In trouble?"

The boy glared at him; then the fire died out of his eyes. "We're going south to get married. Everything's against us here—our folks, and the state law that says you have to wait three days. But we'll do it! I'm quitting college to get a job."

"This your car?" asked Gus gently.

The young man pulled out a wallet and handed over a registration slip. The address was a town 20 miles north of Gus's. "It's my Dad's car. He hasn't reported it stolen, has he? We *were* coming back."

"I'm not a cop," said Gus. "And your father's probably worried about a lot more than his car. Running away with a borrowed car and a few dollars isn't much of a start for a marriage, is it?"

"Nancy wants to go back now, anyway," muttered the lad. "That is, since this happened. She thinks it's sort of an omen."

With a fine file, Gus began cleaning the blued points. "I can dress these enough to get you rolling," he said. "But you need a new set. And a brown ignition coil instead of this black one."

"What difference does the color make?"

"The black coil is an older type. In 1964,

CONTINUED

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Olds went to a coil with a higher primary resistance, in a brown casing. This black coil is an assembly-line blooper. It draws too much current even in the 'run' position. That burns points fast.

"When your girl turned on the ignition to play the radio, without starting the engine, the steady current overheated the points even more than the regular make-and-break ignition juice. Probably they were partly burned already. That finished them. With a brown coil, your points will last."

Gus inspected the filed points, put them back, turned the engine to get the rubbing block on a high point of the cam, and set the gap. The car started briskly. He watched anxiously as the Olds backed out and swung toward the exits. He let out a sigh of relief when he saw that it headed into the northbound one.

With what Gus later realized was fantastic timing, a big sedan rolled in from the southbound side of the parkway hardly a minute later. The driver headed straight for Gus's tow truck.

"Don't go away!" he yelled.

Steam was swirling from under the radiator, and when Gus strolled over he could hear the engine knocking before the driver shut it off. A stocky, round-faced man, with a bristle of unshaved beard over his open collar, got out, scowling.

"Seen anything of a '64 Olds with a teen-age boy and girl in it?" he demanded.

"They just drove out," said Gus.

The man swung back to his car, then turned to Gus.

"It's no good—it's overheating so badly I can't go any farther. I stopped here for water—it's the second time. Think you can do anything in a hurry?"

A balloon of heat welled up as Gus opened the hood. The engine reeked of hot metal and oil. With a rag, Gus cautiously turned the radiator cap. Steam hissed out; only when the pressure had died down did he remove the cap.

No water was in sight. But there were no rust traces of leakage. The fan belt was clean and well tensioned; the radiator core was free of dirt, and so was its lower section, which cooled the automatic-transmission fluid. Gus checked the dipstick; it showed enough oil, with no water droplets in it to suggest a bad head gasket or a cracked block.

On inspecting the cap, Gus thought its spring felt weaker than usual. From his truck he brought a pressure cap of the proper rating and a water can.

"Had any radiator leaks repaired?"

The stocky man shook his head.

"They gave you a low-pressure, seven-pound cap," explained Gus. "That's the kind often used after a radiator's been patched, or is so corroded it won't stand normal pressure. But it opened at a lower temperature, so when the engine reached that, it lost water. Once that happened, the engine overheated even more."

The man shook his head. "Only had that cap two weeks. I was on a long trip and noticed the engine ran warm, so I had the system flushed. They recommended a new thermostat, hoses, and the cap. It ran a little cooler, but still warmer than usual even on local trips—I didn't make any long ones. Today it kicked the top out of the gauge—just when I'm in a hurry to keep those kids from making fools of themselves."

Gus started the engine and began putting a slow trickle of water into the radiator. "They looked like sensible youngsters to me," he said.

"Sensible? You know the odds against teen-age marriages? When I get my daughter home I'll whale the daylights out of

Tokyo measures traffic noise

Attempting to make motorists noise conscious, Tokyo has hung a microphone and flashing sign over one of its busiest intersections. Noise picked up by the mike is translated to phons, or units of loudness, which are flashed constantly.

Standard sound level for residential areas is 50 phons, for busy streets 70. The legend under the number so informs drivers, and asks for quiet.

CONTINUED

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PHOTOGRAPH TAKEN JANUARY, 1965

DUTCH BOY IS A REGISTERED TRADEMARK OF NATIONAL LEAD COMPANY

Since 1950, Joseph B. David's home has only been repainted once. The paint: Dutch Boy House Paint. The reason: More years to the gallon.

The Joseph B. David home in New Orleans, Louisiana, was first painted with Dutch Boy House Paint in 1950. During the next 14 years, it was repainted only once, in 1958, to keep it bright and weathertight through Southern sunshine and New Orleans humidity. Dutch Boy House Paint (made with linseed oil) will last and last, whatever climate your house is in. Your Dutch Boy dealer is listed in the Yellow Pages. Call him today for Dutch Boy House Paint. Or, if you live in a house as big as the Joseph B. David house, be sure your painter uses Dutch Boy. The paint with more years to the gallon.

Dutch Boy Paints. More years to the gallon.

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"We go out of our way to welcome you when you're looking for your first used car.

We're Chevy dealers."

You wouldn't be surprised to hear this at your Chevrolet dealer's.

At a Chevy dealer's, you get the treatment he hopes brings you back *next* time you're looking for a used car. Or even a new car.

He'll also welcome you with many different late-model trade-ins. As well as experienced used car salesmen who actually *wait* on you, once you've looked the cars over.

And because Chevrolet dealers go out of their way for you, you don't have to go out of *your* way for them. You'll find at least one—complete with after-the-sale service facilities—right in your neighborhood. . . . Chevrolet Division of General Motors Corporation, Detroit, Michigan.

USED OK CARS

CHEVROLET

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her . . ." He broke off, spluttering angrily.

"Suppose she's home when you get back," said Gus. "Would you still lick her?"

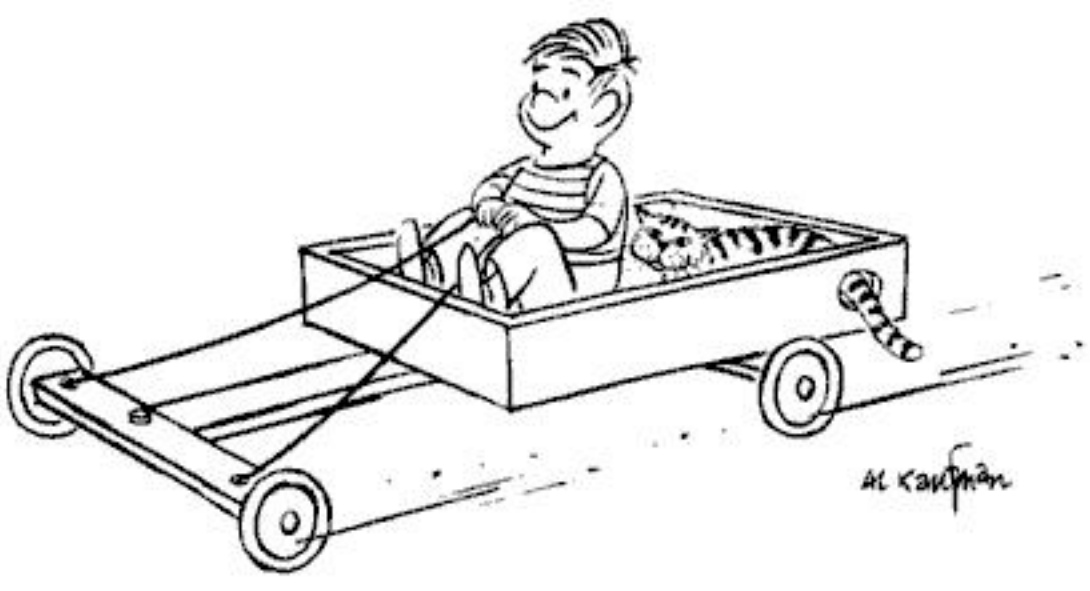
The man grinned weakly. "Never have yet. It's just worry talking. Can't you hurry that up?"

"Might crack the hot block if I did," warned Gus. He added water slowly. The engine ticked over quietly, not knocking.

"Okay," said Gus, putting on the new radiator cap. "This cap will hold more pressure, so the engine can run somewhat warmer before water boils off. Better slow down a bit, though. It would be smart to find out why your engine began heating up in the first place. I have an idea . . ."

"Never mind that now," Gus was interrupted. "What do I owe you? I'm heading south as fast as this car will go."

"In that case," said Gus with a grin as he made change, "you'll be a long time catching up with those two. When they left here, they headed north."



"There's a man here who says he has to see you, Boss," said Stan Hicks as Gus was doing some work in the Model Garage office two hours later.

Gus wasn't surprised to find the big sedan in the shop. The stocky man, now shaven and neatly dressed, grinned at him sheepishly, but obviously calm.

"She *was* home before me," he said. "That young fellow is more man than I thought. They still plan to marry, but only after he graduates and has his first job, and they've saved some money."

"I thought they were sensible," remarked Gus. "How did the car behave with that new cap I put on it?"

"Ran warm but not hot. Got time to take a look at it now?"

Nodding, Gus opened the hood. Little water had been lost. He took a sample in a hydrometer; it showed traces of sealer, but no transmission fluid, as it would if there were a leak between the two sections of the radiator. Gus fitted a pressure pump to the filler neck, pumped it up to 15 pounds, and waited. The gauge held steady.

"Exhaust gases getting into the cooling water will overheat an engine," he said, removing the pump. "But your system's tight. Before I check that new thermostat, maybe I'd better test-drive the car."

Gus started the engine and put the automatic transmission into Drive. There was a noticeable hesitation before the car began to move. Outside, he stepped on the gas. Pickup was poor. On a hill, speed dropped until the transmission made a far-from-smooth downshift. He drove back into the shop, and cautiously touched the transmission case. It was hot. Using a rag, he withdrew the dipstick. The fluid level was low.

"There's the real reason your engine overheated. You must have felt how sluggish the car was, but probably you blamed that on the overheating. Actually, it was your transmission that overheated the engine.

"The transmission fluid transmits all power to your wheels. When the fluid is too low, it foams, can't transmit full power, and gets much too hot. That overloads the oil cooler under your radiator. Some of the extra heat reaches the engine-cooling water above, so your engine runs hot, too."

Filling the transmission to the proper level, Gus again drove the car out. It took hold at once, accelerated briskly. Satisfied, he returned to the shop.

"That was it," he announced. "Just keep the fluid level checked."

Thoughtfully the stocky man paid the bill. "Who'd think a transmission could make an engine overheat?" he murmured.

"Who'd expect a wrong ignition coil to stall an elopement?" countered Gus.

The man looked at him shrewdly. "Heard about that. But I've got a feeling you had something to do with it, too. Thanks."

"Not me," said Gus. "Only way you can thank anybody for that is to write a fan letter to Detroit." ■ ■

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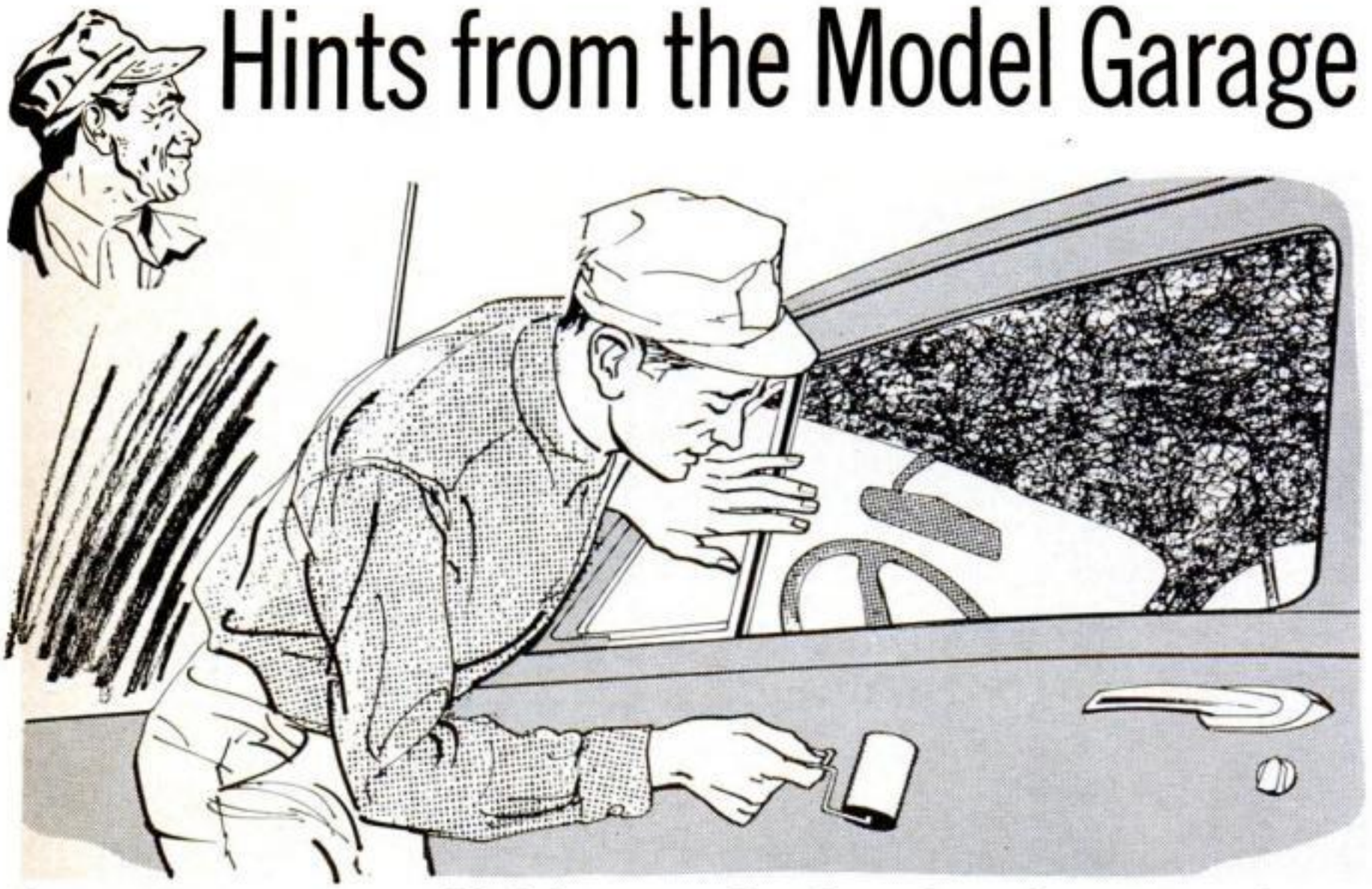
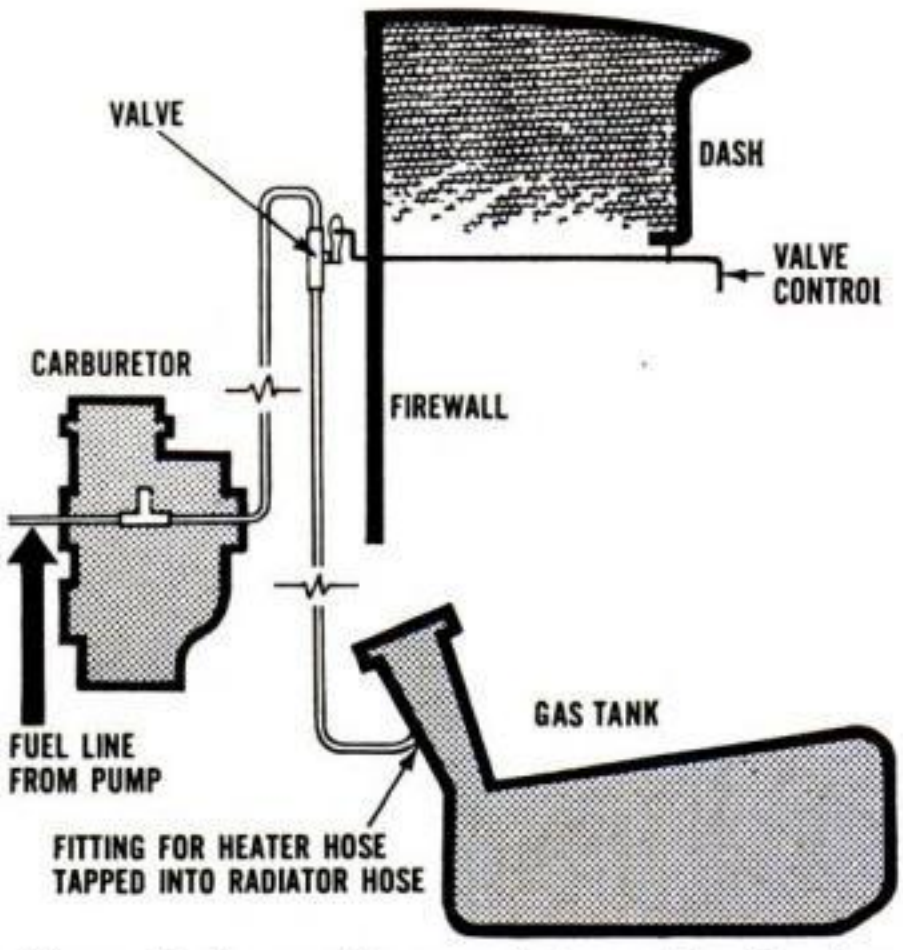
Hints from the Model Garage



If you paint your own car and find that you have troubles with sags or runs in the paint, here's a 100-percent remedy: Moisten a small sponge roller in enamel thinner, and keep it handy. Watch closely for sags, and when one develops, squeeze the sponge roller almost dry and run it over the sag area. The sponge will quickly absorb the excess paint. Then spray the area with a dry spray until the paint blends to the eye. When the paint has dried thoroughly, there will be no trace of the sag.

Stuck spark plugs can be removed intact from V-8 engines with deep wells if you place a small-handled ⅜" screwdriver alongside the socket extension in the well. This way, all necessary force may be used on the handle without breaking the plug.



Vapor lock can be cured by a bleed valve and new pipe leading back to the gas tank. Couple the pipe to the fuel line with a T union. Mount the valve on the firewall with linkage to a handle under the dash. Open the valve whenever vapor lock threatens.

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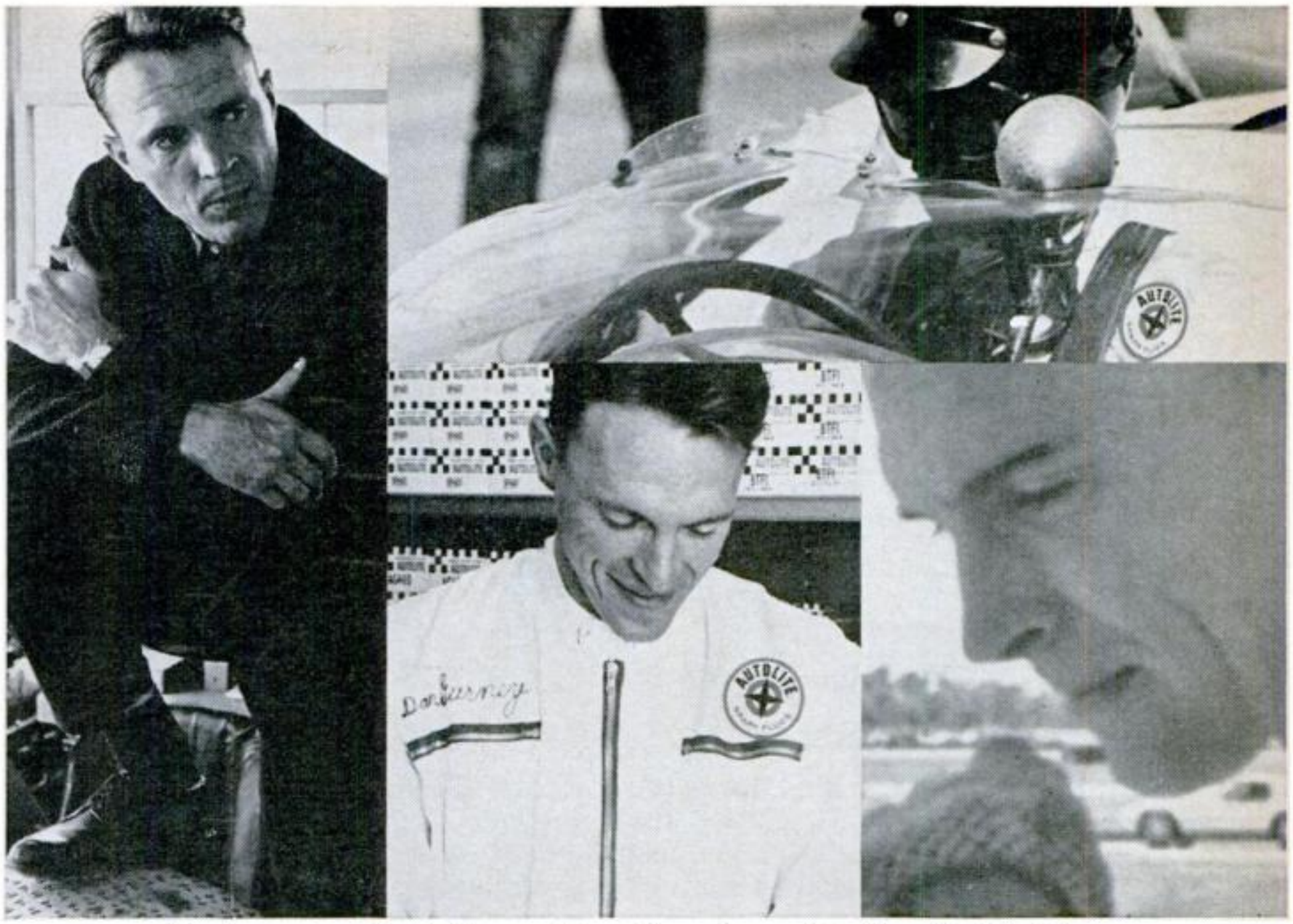

Dan Gurney, Grand Prix driver and three-time winner of the Riverside 500, tells you

"How to improve your car's performance without raising the hood..."

Blow out your engine on a fast stretch of highway . . . it helps get rid of carbon in the combustion chamber and cleans plugs of deposits that result from slow driving and idling. But take care. Lead deposits that form on plug insulators become conductive if heated rapidly, shorting plugs and causing misfiring. What's more, the deposits may become so badly fused that you can't remove them even by cleaning. Then it's "goodbye," plugs!

So don't just stand on it all of a sudden. Accelerate slowly. And stay within safe, legal limits. With today's "long" axle ratios that let big V8 engines loaf along, you might have to run in an intermediate gear to get the cleaning job done.

Power Tip plugs, pioneered by Autolite, all but eliminate the spark plug problem. Autolite Power Tip plugs have long insulator tips and electrodes that extend further into combustion chambers. The result is that swirling gases and higher tip temperatures keep Autolites freer of deposits—keep power and economy at a peak longer.

"Watch the closed circuit telecast of the Indianapolis 500. Check your local newspaper for details."

AUTOLITE

PRODUCTS OF Ford MOTOR COMPANY

RIDE WALT DISNEY'S MAGIC SKYWAY AT THE FORD MOTOR COMPANY PAVILION, NEW YORK WORLD'S FAIR

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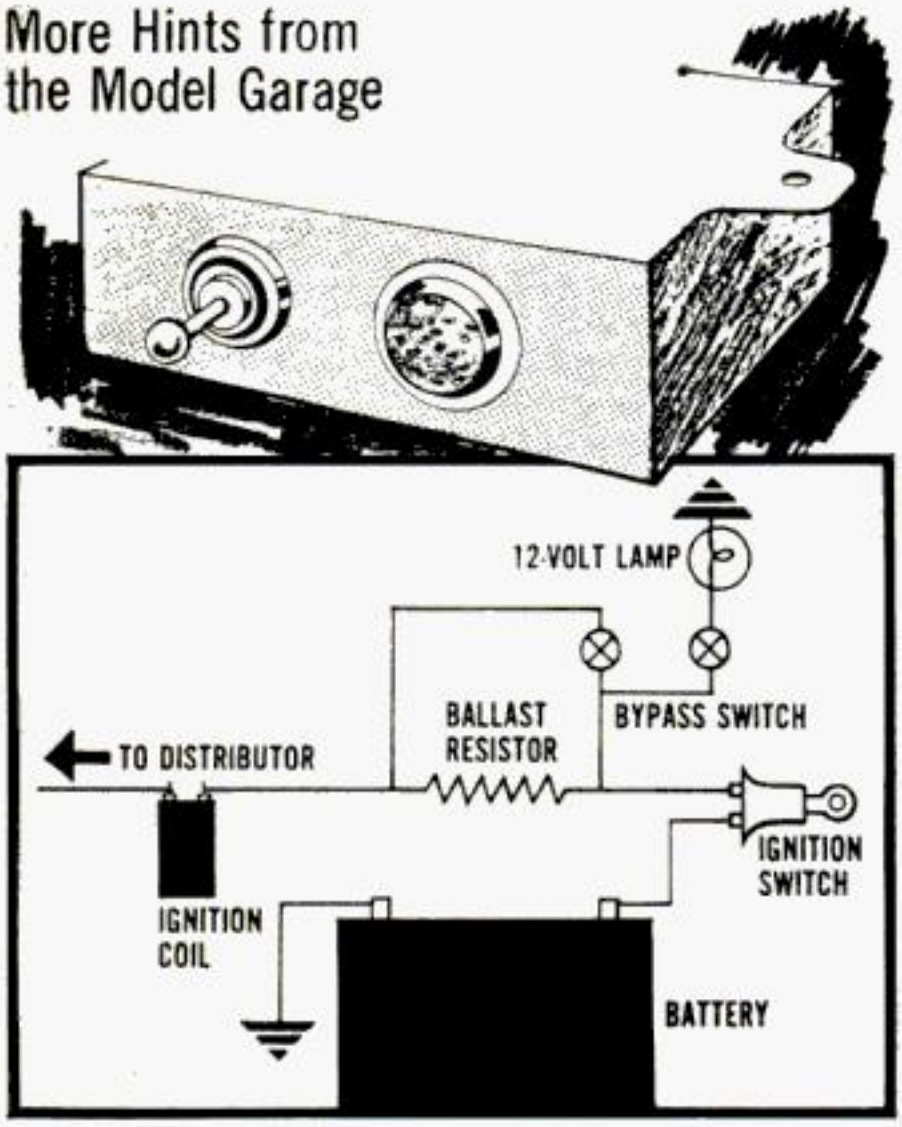
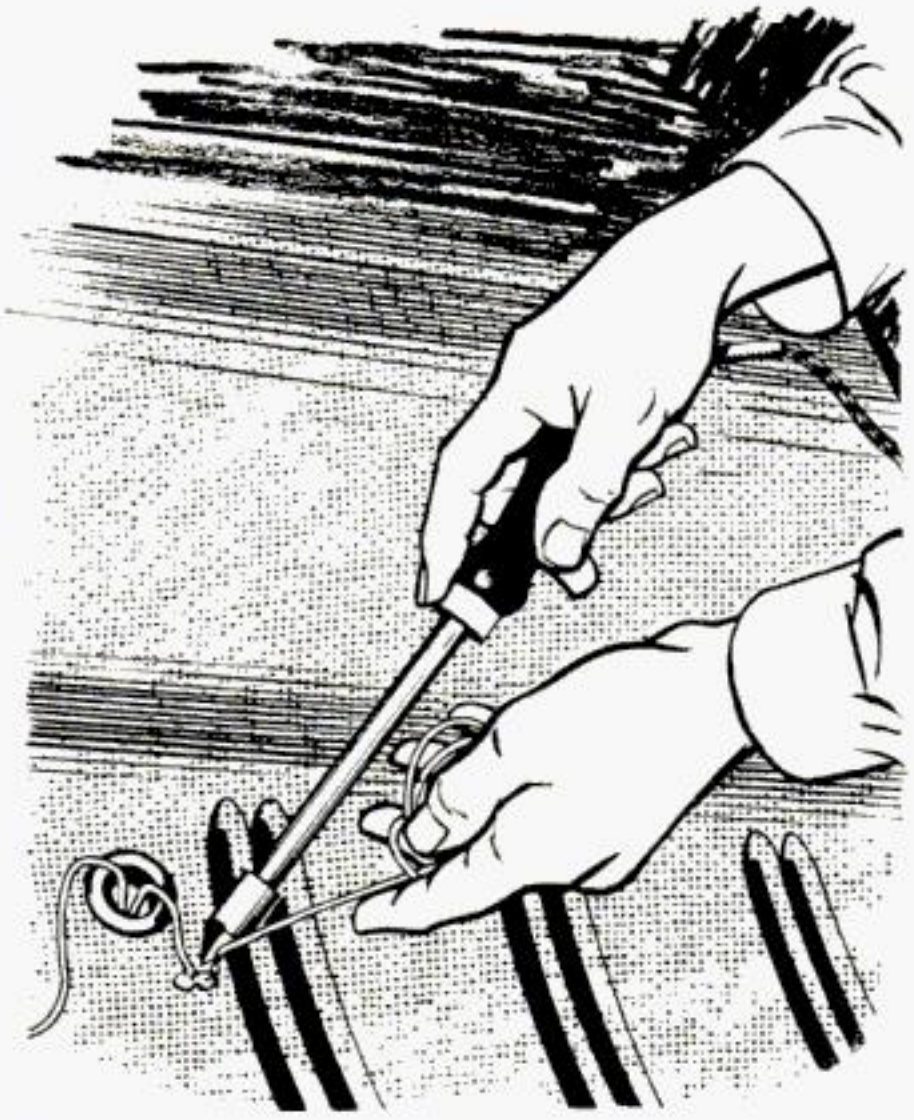
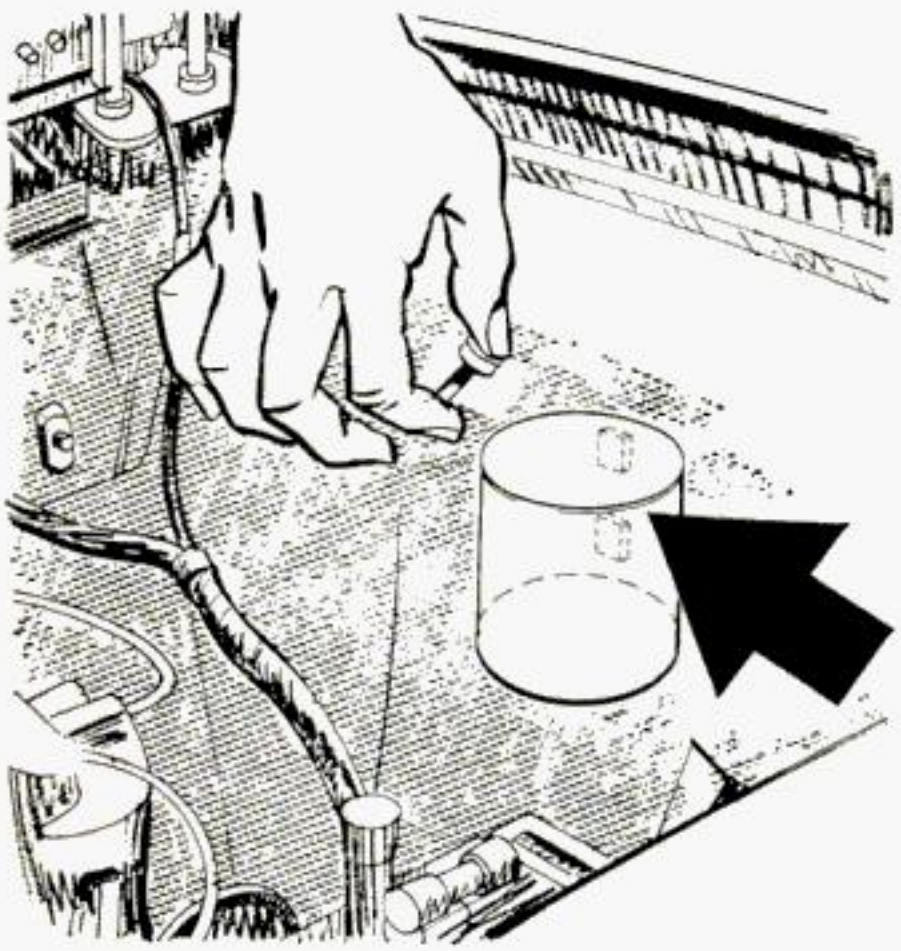
More Hints from the Model Garage



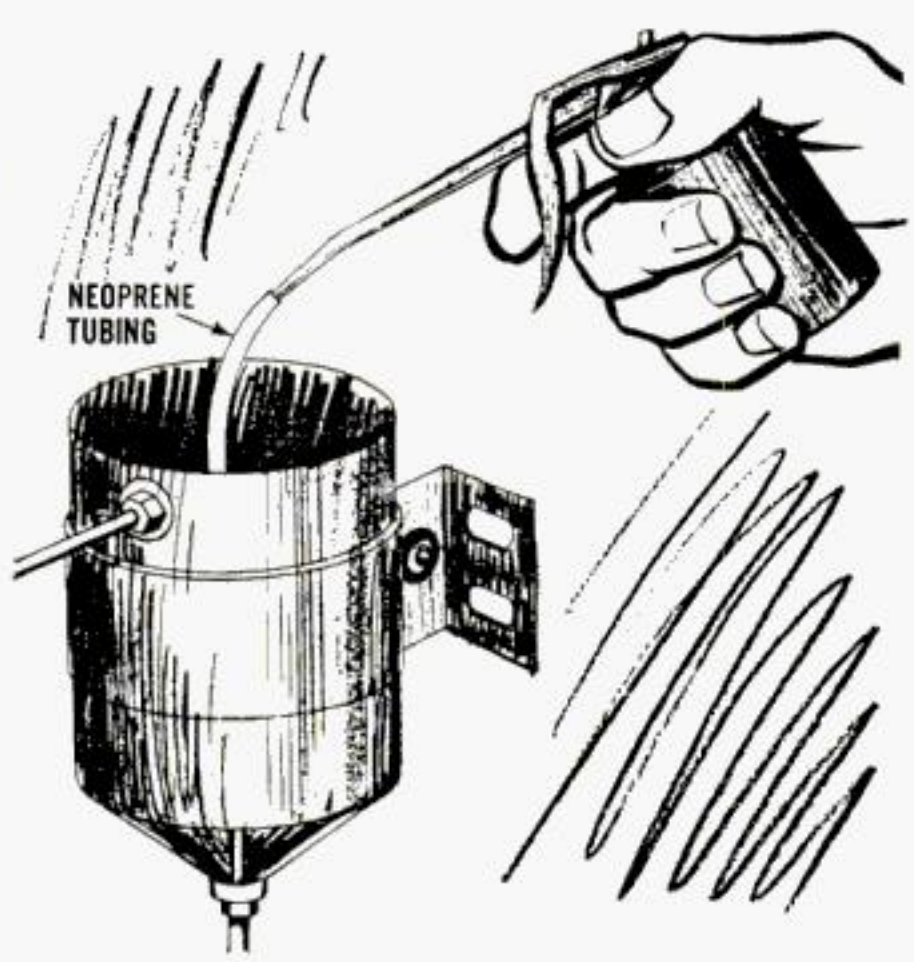
Cold-starting trouble in your Rambler V-8? Try rewiring with a switch bypassing the ballast resistor, to avoid overheating and loss of voltage when it's most needed. The switch needs a pilot lamp to remind you to turn it off when engine is running.



If a gas gauge gives erratic readings in any 1957 or later Chrysler car, it's a safe bet that the tank unit has a poor ground connection. A simple remedy: Solder a wire from the twist-on plate to some nearby spot on the body shell of the automobile.



You won't lose small parts (nuts, bolts, washers) if you try this idea: Solder two magnets to a small can. The magnetized can will then stick to the cowl, hood, or other convenient places while you work. Keep the parts in the can until needed.



When replacing an oil filter, the housing can be pumped dry of dirty oil with an oil-can fitted with a short length of neoprene tubing as a nozzle extension, as shown above. Wipe out whatever drops of dirty oil remain in the housing with a rag.

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What problems will these plugs cause?

What does this symbol stand for?

Left plug is shorted—usually misses at any speed. Right plug is bent—causes on-and-off missing. The life preserver stands for Quaker State Motor Oil—the best engine life preserver for your car. Made from 100% Pure Pennsylvania Grade Crude Oil, Quaker State keeps your car on the road and out of the repair shop. To keep your car running young, always ask for Quaker State Motor Oil—by name.

QUAKER STATE OIL REFINING CORPORATION
OIL CITY, PENNSYLVANIA

Is Atomic Industry Risking Your Life?

[Continued from page 49]

leaked into the sewage system of Ames, Iowa, for over a year. Radioactive sludge from the sewage plant was spread as fertilizer at the city airport, a parkway, and a cemetery before the leak was discovered. The AEC says no one was affected by the low-level radioactivity.

Transportation accidents have long been seen as a serious potential threat. In a 1962 AEC conference on testing of shipping containers, the chairman, Dr. J. T. Thompson of Johns Hopkins University, said: "I don't think I am an alarmist, but I ask you to imagine how astronomical the costs may become if we ever do have to close down a large city or a river system." Fortunately, only minor accidents have occurred so far.

Storage of radioactive wastes is a problem that will get bigger. Most low-level wastes are buried on AEC property. High-level wastes, in liquid form, are stored in three AEC tank farms. The tanks must be continuously cooled, since the liquids are boiling due to heat generated by radioactivity, and the wastes must be transferred to new tanks periodically, as the tanks corrode. It will take 600 years for the radioactivity of these wastes to decay.

Radiation Injury

Radiation accidents that cause death, sterility, or radiation sickness are rare. Frequently, radiation somewhat greater than the "safe limits" has no observable effect. The accident report implies that the victim has escaped injury.

But are there any "safe limits"? In a 1957 speech, Dr. Lauriston S. Taylor, chairman of the National Committee on Radiation Protection, which sets U.S. radiation standards, said: "The establishment of permissible levels of radiation exposure is not basically a scientific problem. Indeed, it is more a matter of philosophy, of morality, and of sheer wisdom . . . Solutions of the radiation-protection problem will have to be based on a risk philosophy."

In practice, radiation tolerances for atomic workers are arbitrarily set at levels that seem quite low, and radiation tolerances for the public are arbitrarily set lower. However, studies by the U.N. Scientific Committee on the Effects of Atomic Radiation, the U.S. National Academy of Sciences, and other groups have been unable to find any "threshold" below

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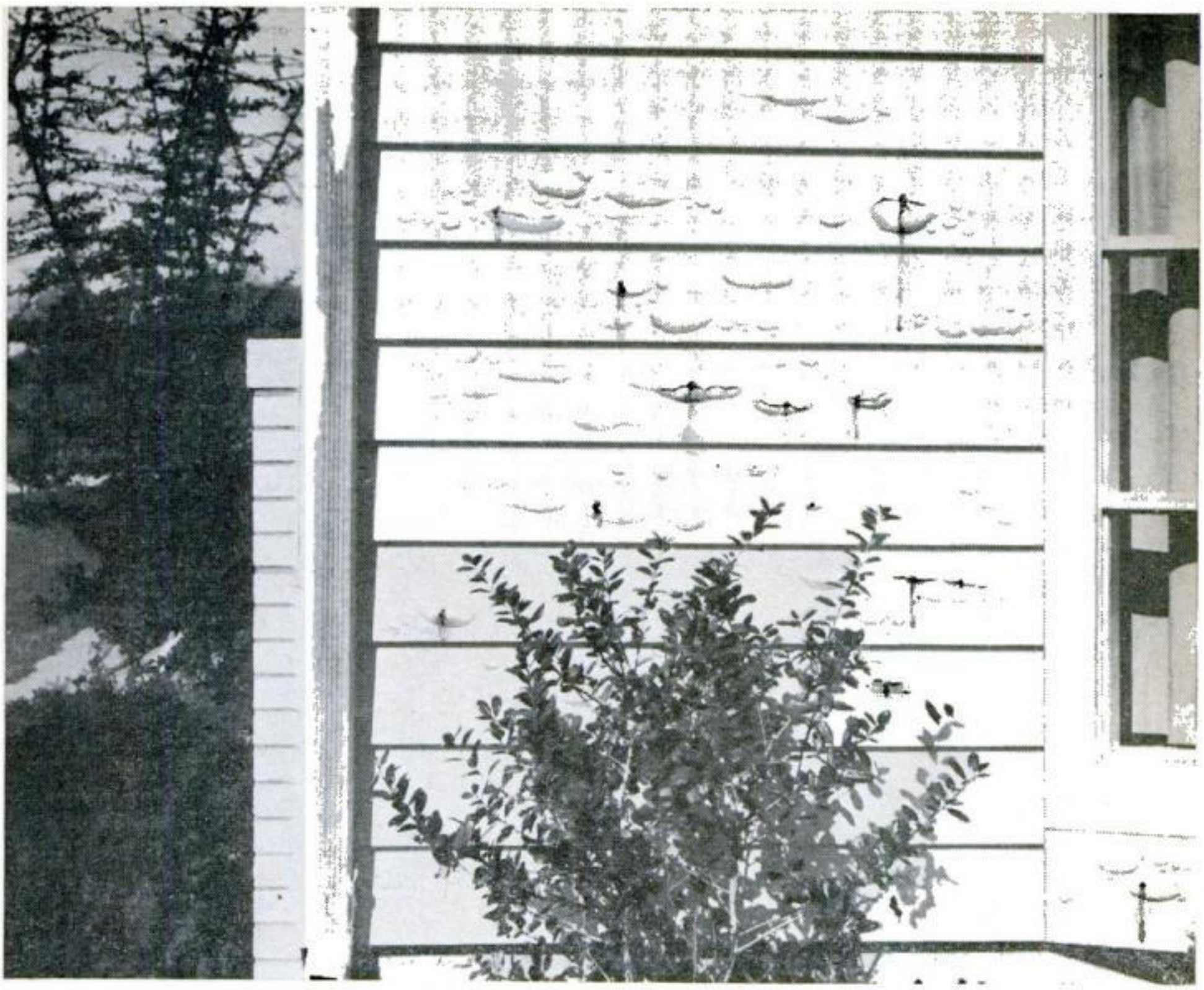

Got this problem? Want to avoid it next time?

The paint you used last time might have brought this problem on itself.

Moisture tries to get out of your home and can't because it can't get through oil-base paint fast enough. In trying, though, it causes blisters. Then peeling.

Du Pont Lucite® House Paint has been proven to resist blistering and peeling far more effectively than oil-base paints.

Lucite dries in 30 minutes. It holds its color longer than oil-base paints do. You have to prime-coat only bare places. You can paint damp surfaces—right after a rain, for instance. You can paint wood, masonry, stucco—any surface. And you clean up—both you and your brushes—with soap and water.

Less work, more wear.

The name is Du Pont Lucite House Paint.

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BETTER THINGS FOR BETTER LIVING
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Less work . . . more wear

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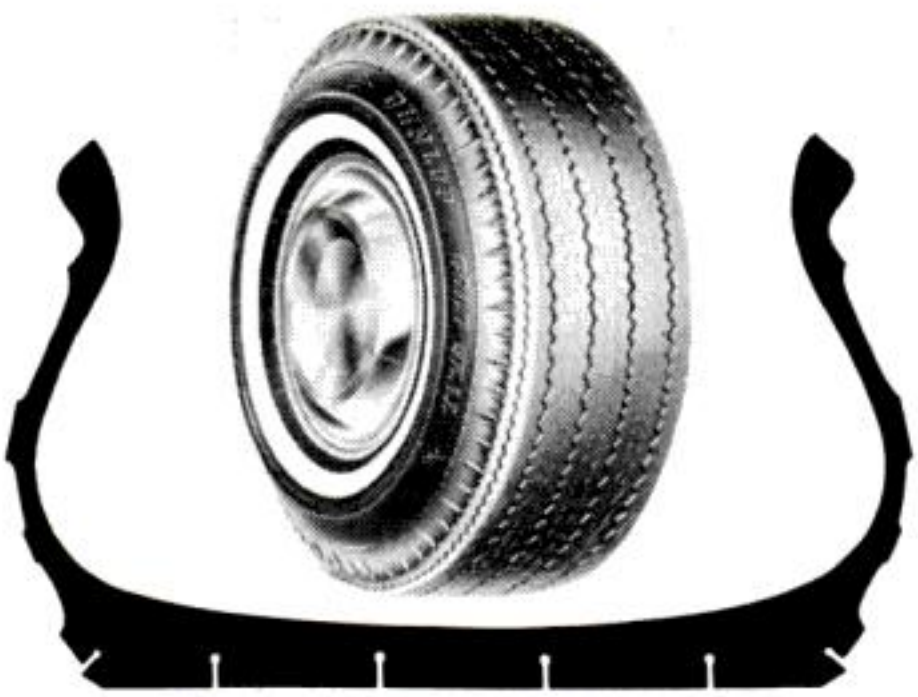

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A First . . . the new popularly priced Dunlop Gold Seal Low Profile tire has been tested and proved safe at sustained speeds of 100 mph, to make certain you have a wide margin of safety even at today's freeway limits.

You also get new mileage and traction advantages in the Gold Seal:

LOW PROFILE The new Gold Seal is designed low to complement today's road-hugging automotive styles.

LONG MILEAGE A wider footprint area spreads out the load for longer wear. Tyrex or nylon full four-ply construction for greater strength.

TRACTION-WIDE PRINT There's more surface contact with the Gold Seal, and tread sipes are more plentiful for phenomenal traction, especially on wet pavements. You also get patented Dunlop Safety-Shoulders to carry you up, down, and diagonally over obstructions without a lurch.

NEW INNERLINER Our new pressure-seal innerliner holds air four to five times longer than ordinary tires.

Ask your local Dunlop dealer to show you all the benefits we've engineered and built into the low profile of this new Gold Seal. From 100 mph safety to innerliner, it's the real tire for a change.

* "We certify that Gold Seal Low Profile tires were in excellent condition after numerous tests at sustained speeds of 100 mph."
Tire Engineering Service Testing, Inc., Carson City, Nev

DUNLOP
TIRE AND RUBBER CORPORATION, BUFFALO, N. Y. 14240

which no biological effects of radiation will occur.

Effects are likely to be delayed, and to occur in only a percentage of those exposed. These effects may show up as types of cancer that occur naturally in large percentages of the population. So, for all but very high doses of radiation, it's often impossible to predict what will happen to any one individual.

How Safe *Is* Our Atomic Industry?

In realistic terms, the accident record of the industry has been good so far. But it's not so easy to be completely optimistic about the future. The growth of the industry, and the continuing pressure for power reactors in populated areas, increase the likelihood of more and bigger accidents. It's also possible to question whether the industry is adequately regulated.

Licensing of privately owned nuclear facilities is one question mark. Of the 13,000 licenses in existence, 9,200 have been issued by the AEC and 3,800 by the nine states that have licensing agencies.

The states vary in their approaches to safety. AEC policy is that establishing specific safe procedures is interference in private business. A licensed facility is required to be safe, and is subject to inspection, but working out the details of safety is the responsibility of the licensed company.

It's getting harder to find out how safe the industry is. AEC annual reports used to list both AEC and licensee accidents, but this year there are no lists. Accident reports by licensees are supposedly available in the AEC Public Documents Room in Washington. However, the only way to find them is to go through the files on the individual licensees—all 9,200 of them.

What would be done if radioactive contamination from a nuclear accident threatened an American community?

A spokesman for the U.S. Public Health Service, which monitors radiation in the air, in water, and in milk all over the country, told POPULAR SCIENCE that recommendations would have to take into account the impact of the protective action itself. "The impact of a protective measure, such as evacuating New York City, in terms of the national interest or other factors, might be a greater hazard than the health hazard of contamination," he said. ■■

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FREE Catalog showing complete line of hand tools . . . yours for the asking.

Urheberrechtlich geschütztes Material

New silicone rubber sealants stop the leaks and fix the things you couldn't fix before

because these General Electric adhesive/sealants won't crack, shrink, harden or leak

Caulk tub and tile

Repair rubber goods

Fix gutters, windows

Stop windshield leaks

Now you can caulk a bathtub, seal a storm window, stop a windshield leak, mend fabrics and restore 100 other things to usefulness yourself – before it costs you big money.

Developed in G-E chemical laboratories, these new silicone rubber adhesive - sealants are permanently flexible and just will not age.

Bathtub Seal stretches when tub settles. Pure white Bathtub Seal cannot shrink, dry out or wash away. With one application you will solve the constant problem of bathtub, sink and shower leaks. Reset loose tile, glue on towel racks and fixtures.

Clear Seal makes invisible repairs. Use transparent Clear Seal to mend tents, raincoats, leather goods, rubber boots, clothing. Seal basement cracks and aquariums. Mend plastic windows on convertibles.

Metal Seal looks like aluminum. It makes permanent, weatherproof repairs to storm windows, rain gutters and fixes small plumbing leaks.

Auto Seal repairs leaky windshields and convertible tops. Black Auto Seal will fix loose door gaskets, upholstery, even replace decorative chrome.

General Electric silicone rubber sealants will bond to glass, metal, wood, ceramic, fabric, leather, most rubber and plastics. They are available in most stores.

If you can't find them please tell us the name of the store where you tried to purchase them and send $1.95 per 3 oz. tube to Silicone Seal, P. O. Box 1300, Long Island City, N. Y. Make check or money order payable to Silicone Seal and specify the tube(s) you want by name.

GENERAL ELECTRIC

How to Buy the Right Ladder

[Continued from page 160]

on all metal ladders say so. But then anyone (short of an expert) who gets close to a power line with *any* ladder is asking for trouble.

Ladders of glass-fabric-reinforced plastic are pretty much pro equipment. They have great strength and resilience, are spark- and moisture-proof, even acid-resistant. They generally weigh slightly less than wood ladders, but more than aluminum ones. The cost will deter most home users. For a particular length, one dealer prices wood ladders from $24 to $32, aluminum from $23 to $55, magnesium at $48, and fiberglass at $118.

Quality you may not see. Obviously a wood ladder should have smoothly sanded rails with rounded corners, and wood free of knots. A metal ladder should be free of burrs and sharp edges.

When a ladder price seems like a real steal, a closer look may reveal why. Home-type wood-ladder rails vary in size from about 1⅛″ by 2½″ to 1 5/16″ by 2¾″. Widths run from 16″ to 18″ overall. Rungs go from 1″ to 1¼″ diameter. Material being equal, the bigger and wider it is, the stronger, more comfortable, more stable the ladder.

Metal ladders vary even more in dimension. Rail sections run from ¾″ by 2½″ to 1 1/16″ by 3″. Widths range from 14½″ to 18½″. Round rungs vary from 1″ to 1¼″. Rail sections are I, C, or U shaped, with great variations in web and flange thickness, and in alloy strength. From an engineering standpoint, I-beam construction is best.

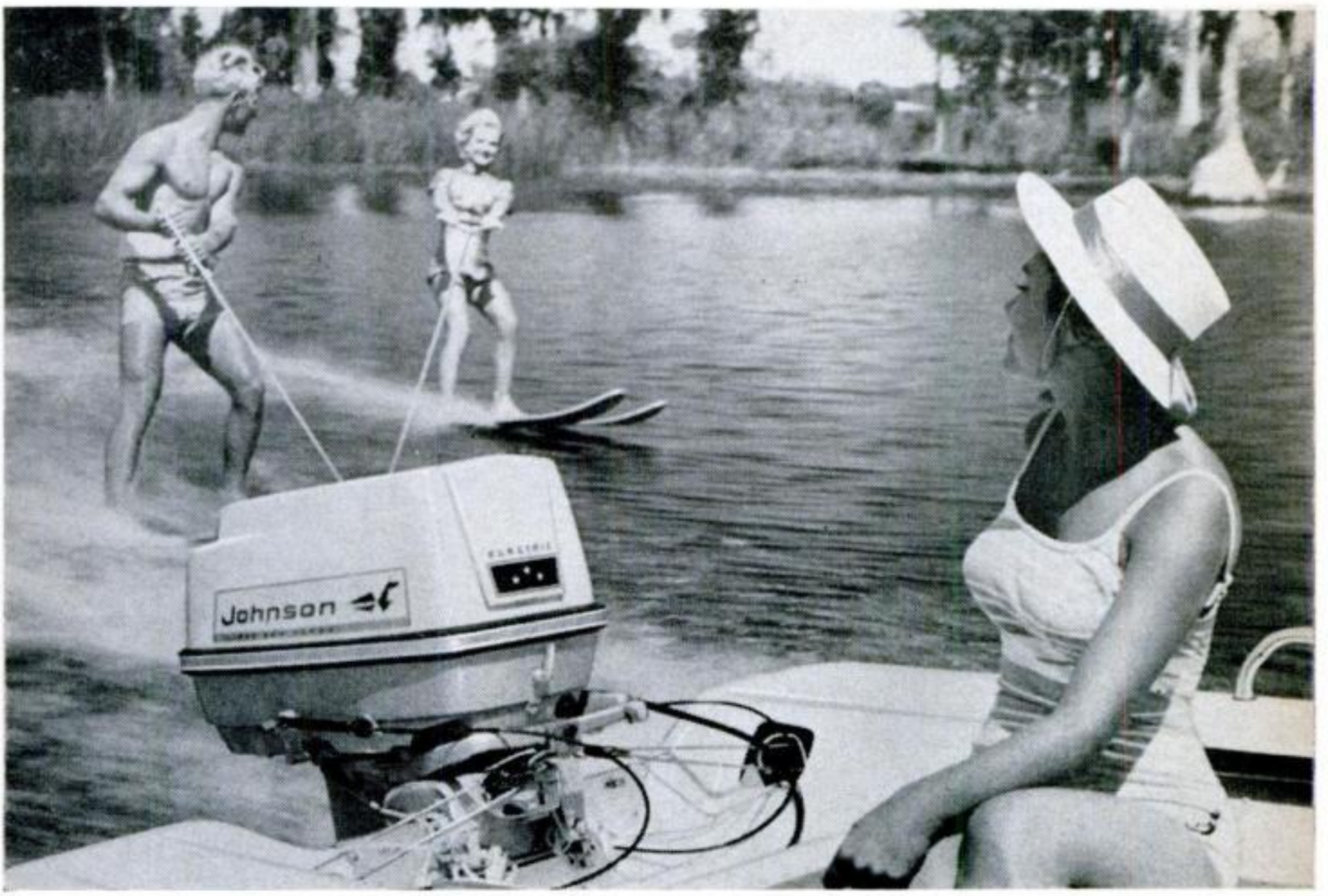
Features you may want. Advantages of wood ladders usually take the form of reinforcing rung tie rods, extra bracing, and metal facings. On metal ladders, the higher the price and quality, the more often you find features that add safety, comfort, and convenience. Here are some to check:

- Flat steps. Instead of round rungs, these are extruded, grooved, and flat-topped. Widths vary from about 1¼″ to 1⅞″. Flat steps can make a significant difference in foot comfort, and perhaps in safety.
- Rollers. Replacing the bumpers on the top of some extension ladders are nylon rollers—a help if you don't pull the ladder away when you raise or lower it.
- Handrails. Upper extension sections equipped with metal handrails are a nice climbing aid, and welcome for bracing your legs when reaching over the edge. ■■

Urheberrechtlich geschütztes Material

Want an outboard that will breeze a runabout at top speed, skim 2 skiers with ease, uses a 50-to-1 gas-oil diet and sells at a cool, cool price?

It's here!
The carefree, new 33 (a Sea-Horse, of course!)



This new Johnson 33 is a lot of outboard at any price—and at its price, it's an incredible outboard. It's an exceptionally strong all-purpose engine—not fancy but fast. Plenty of pull for two adult skiers. Plenty of push for heavy workboats. Your choice of electric or manual starting.

Lower cruising costs, too! Economical? The Super Sea-Horse 33 gets 3 hours cruising time from one 6-gallon tank. And it uses a 50-to-1 gas-oil mix to lengthen plug life while *halving* oil costs.

17 new models in 10 power classes! Pick your power, pick your price! This year's Johnson line is the longest, strongest ever. Your choice of new Sea-Horse engines at 90, 75, 60, 40, 33, 18, 9½, 6, 5 and 3 hp. All are corrosion-resistant (no need to flush them after salt water use). All are as quiet as the man who forgot the beer. All are backed by our now famous *2-year* warranty*.

For the right engine to fit your needs, see your Johnson dealer. He's in the Yellow Pages. Johnson Motors, 1947 Pershing Rd., Waukegan, Illinois. Div. Outboard Marine Corp. In Canada: Johnson Motors, Peterborough, Ontario.

*For 24 months after purchase, Johnson Motors will replace, without cost to the original purchaser, any part of its manufacture which upon inspection proves to have failed in normal use due to faulty material or workmanship.

Another carefree Johnson ...first in dependability

Urheberrechtlich geschütztes Material

BOND STREET

The Pipe Tobacco that stays lit!

Bond Street keeps burning because of its old English cut—a combination of flakes for even-burning and cubes for slower-burning. You'll like its aroma of fine domestic and imported tobaccos, too.

How to scrape your pipe

Carefully. Use a reamer and scrape so you cut only the carbon, not the briar. One way to stop superficial caking from forming is to scrape the bowl several times a week.

A dog needs a boy, a boy needs his father, and his father his pipe.

A product of Philip Morris Inc.

BEFORE Refinishing

clean and dull gloss

on old enameled or painted surfaces. Wil-Bond removes wax, grease, dirt. Sets up a slight tack so new finish will spread evenly and bond tightly. You'll have a smooth paint job. Get Wil-Bond at your paint or hardware store. Write for free Wil-Bond folder.

Send 25¢ for Refinishing Guide

WILSON-IMPERIAL COMPANY
121 Chestnut St., Newark 5, N.J.

Tides to Drive Mammoth Power Plant

[*Continued from page 93*]

from the real ones. It does so by combining, with tidal power, the modern hydroelectric principle of "pumped storage." A 13-mile reservoir formed by the Rance channel, behind the dam, will serve as a giant hydraulic storage battery. It can be charged by using the turbines as pumps, and then drained as desired.

How all this works is shown by a typical program, for tides of medium height:

- As the tide rises, water flows inward through the water tunnels—spinning the turbines and generating power.
- Near the turn of the tide, generating stops and pumping begins—to fill the reservoir higher than the tide alone would, and thus increase the hydraulic head for the next generating run.
- As the tide falls, water flows outward through the water tunnels—again driving the turbines and generating power.
- Finally, the turbines again are converted into pumps, to drain the reservoir lower than it would otherwise fall—and increase the hydraulic head when the tide comes in again.

Programs to suit tides. The sample program just given—"two-way with pumping"—is only one of a variety available. When tides are small, the turbines will be operated only one-way, with pumping. When tides are strongest, the turbines will operate two-way, without pumping. Other cycles, more complicated, will serve best at other times. From a whole array of mathematically designed programs, the operator of the plant will choose the one best suited to the tides of each day of the year.

Generating runs, though dependent on natural tides, can be timed with comparative flexibility. Pumping provides extra water, whose release through the turbines can be shifted to coincide with demand for power. Generating can be prolonged by varying the turbine blades' pitch to take a bigger bite as the head drops—and thus keep the turbines turning at constant speed.

Out of four possible power runs every 26 hours, three can usually be juggled about the clock to fit in with the national electric system's needs. By judicious selection of pumping and power sequences, the operator can eliminate the effect of the lunar rhythm—and bring the tides' offbeat timing into harmony with man's 24-hour day.

The Rance scheme is to deliver electricity

Urheberrechtlich geschütztes Material

22

22 ammo *isn't* all the same. Only Remington "Hi-Speed" 22's have super-hard "golden" bullets. Made to micrometer tolerances for tack-driving accuracy. With famous "Kleanbore" priming. In short, long or long rifle cartridges, solid or hollow point. Ask for them at your Remington dealer's.

"Kleanbore" is Reg. U.S. Pat. Off. and "Hi-Speed" is a trademark of Remington Arms Company, Inc., Bridgeport, Conn. 06602. In Canada: Remington Arms of Canada Limited, 36 Queen Elizabeth Blvd., Toronto, Ont.

Remington DU PONT

this is not a butter knife!

A butter knife never had it so good! Our putty knife goes through 14 steps to insure perfection. Any Red Devil tool you buy is your best buy. At paint, hardware, variety stores. ■ Try Schalk's Super Savabrush Cleaner — another fine Schalk Home Repair Product.

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Does an hour's work in minutes! Paints anything from toy to house. Pays for itself with the first big job. A professional sprayer for the amateur!

Speedy Sprayer "Compact No. 404"

only $39.95

Slightly higher Denver West.

Write for "How to Spray" booklet and catalog.

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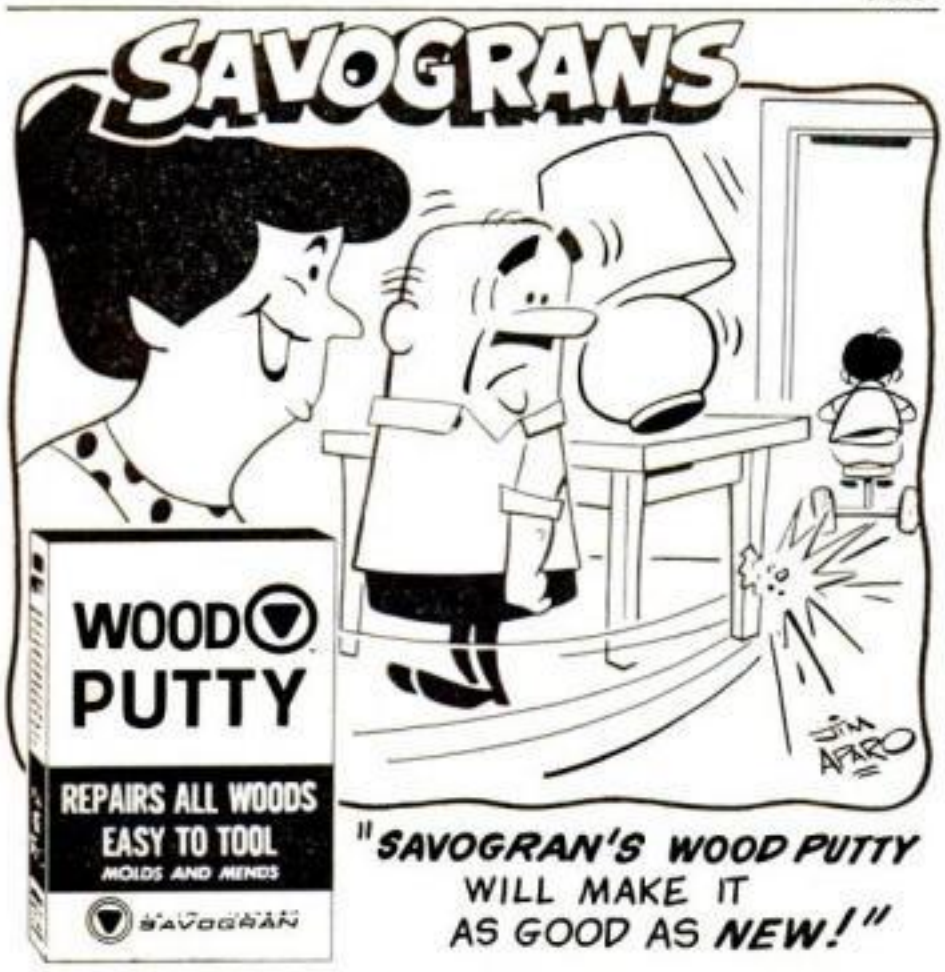
Electric engraver: This new compact Dremel permanently engraves names or identification numbers on steel, copper, brass, silver, aluminum, glass, wood, plastic. Handy for marking tools, personal and business valuables, jewelry, industrial tools and dies — anything requiring permanent identification. Weighs only 7 ozs. Exclusive calibrated stroke adjustment regulates depth of engraving. Solid carbide engraving point. Diamond points also available. Price $14.95 with solid carbide engraving point and storage case. *Dremel Mfg. Co., Dept. 95-AF, Racine, Wisconsin.*

4421



IT IS . . . a powder to be mixed with water into a smooth paste. Inexpensive . . . it can be colored to match woods.

IT DOES . . . fill cracks, gouges or holes. Begins to harden in 15 minutes. When set, it can be shaved, carved, sawed, sanded. Will never shrink or pop out.

"Where Paint Is Sold"

SAVOGRAN

NORWOOD, MASS.

Addison, Ill. Los Angeles, Cal.

Tides to Drive Mammoth Power Plant

to the French national grid during peak-load periods of the working day and evening. In between them, it prepares for the next one by building up the maximum head of water across the dam. Energy for the pumps will be drawn from the national grid during "off-peak" hours—generally late at night, at midday, and in early evening.

Power consumed for pumping will vary from five percent of the plant's generating capacity, with a spring tide, to perhaps 80 percent at neap tides of only 11 feet. Even at the high figure, the tidal plant is economic. The power for pumping is drawn from steam and hydro plants when they would otherwise be idling. Later the tidal plant returns this power and more.

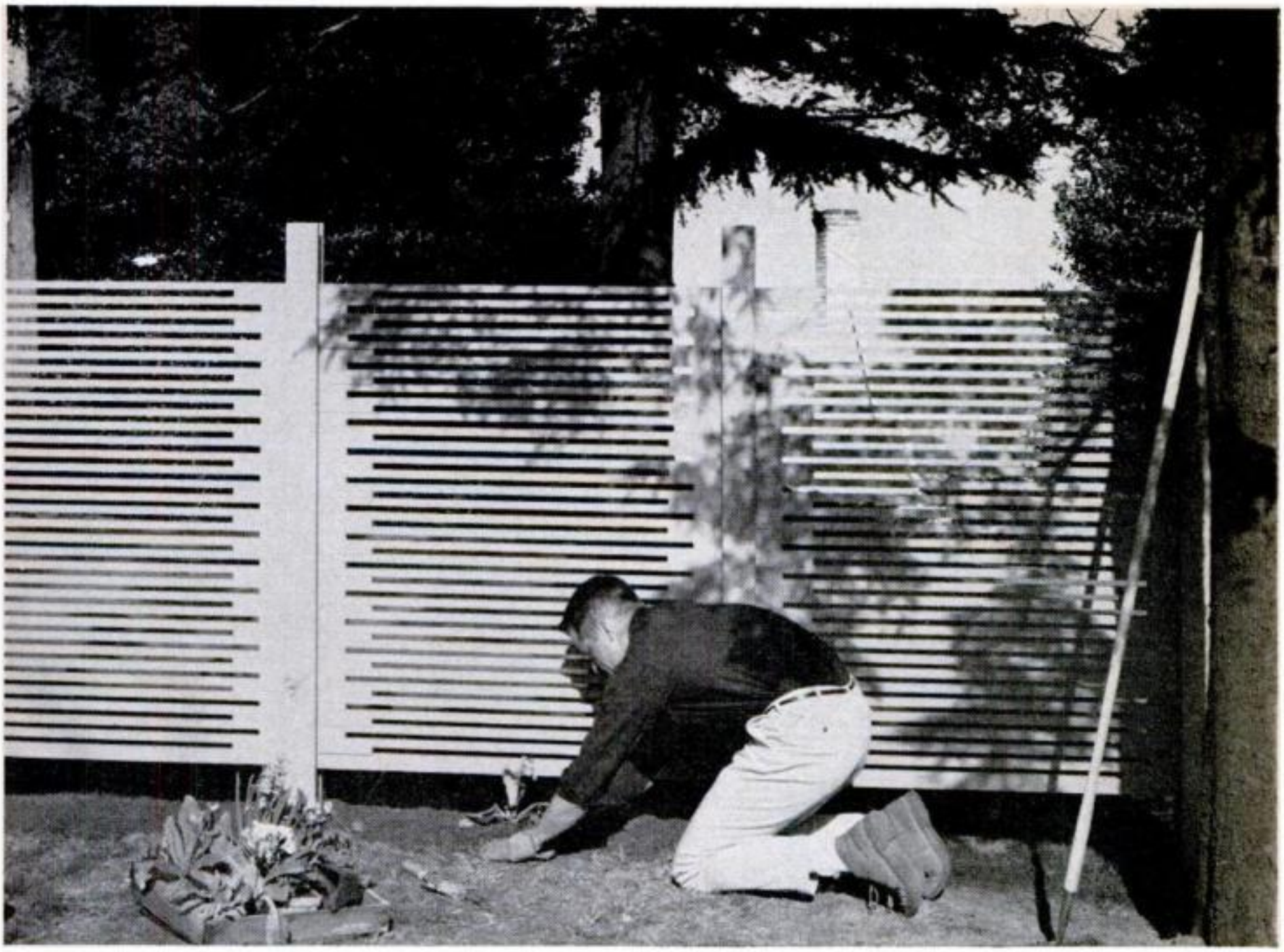
A 9,000-kw. prototype of the new bulb turbine was successfully tested in a canal lock at St. Malo in 1959. Experiments with a scale model of the Rance estuary clinched the feasibility of the tidal-power project, and construction got under way in 1961. By the fall of 1963, builders completed a cofferdam surrounding the main-dam site, so that it could be pumped dry for erection of the midstream powerhouse. At this writing, a shipping-lock section and a spillway section of the Rance barrier are completed and in operation, and construction of the power station itself is well along.

Other tidal schemes. Emphasizing the $72-million French project's boldness, the only tangible progress elsewhere toward tidal power appears to be a modest Soviet experimental plant of 1,200 kw. on the White Sea. It develops a small fraction of the power of France's prototype bulb turbine of 1959, although the Russians speak grandly of it as the forerunner of a 14-million-kw. installation of the future (date unspecified).

In this hemisphere the controversial idea of harnessing tides up to 26 feet at Passamaquoddy Bay on the Maine-Canada border was last revived in 1963, when the U. S. Interior Department proposed a tidal plant that would yield a million kw. for just one hour daily. So far, the plan has languished without takers.

Successful operating experience with France's bulb turbines might reopen the Quoddy scheme. And it could be expected to spur tidal-power projects proposed at other sites around the world, including the mouth of the Severn River in England and the coast of northern Australia. ■■

Urheberrechtlich geschütztes Material



Finish your yard with a custom-designed fence for less than $20.

Looks nice, doesn't it? And different. That's because a professional designed it for you. You can put it up in your yard over a weekend for as little as $20. (It's 5′ high; 8′ long.) Western Wood is so easy to work; easy to saw; easy to nail. When it's up you can stain it or paint it. Here's something else nice about Western Wood . . . it keeps its good appearance for a long time . . . a real long time, no matter what the weather.

If you want the plans for this fence and two more custom designs (plus three variations), ask your retailer for Western Woods' Do-It-Yourself Fence Book. He'll also give you a beautiful, full-color Fence Idea Booklet. If he is out of them, drop us 10c and the coupon and we'll send them to you.

Here's my dime. Please send me the Do-It-Yourself Fence Book and full-color Fence Idea Booklet.

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NEW from Du Pont

for every car with an automatic transmission

DOES TWO JOBS . . . All transmission fluids contain certain additives which wear out with use. Du Pont "T-Seal" is formulated to replace those worn-out additives and to revitalize the transmission fluid.

IT'S A SEALER . . . Du Pont "T-Seal" stops automatic transmission leaks by chemically reconditioning the hardened, leaking seals. Prevents leaks from occurring by keeping seals soft and pliable. Saves costly transmission overhauls.

IT'S A TUNE-UP . . . Du Pont "T-Seal" renews the efficiency of the transmission fluid itself. Prevents formation of harmful sludge and varnish which could damage precision-built transmission parts. Helps stop slippage and assure quiet, smooth shifting. Prolongs the life of the transmission.

Prevent automatic transmission problems before they start. Get Du Pont "T-Seal" now at service stations and auto supply stores everywhere.

Better Things for Better Living . . . through Chemistry DU PONT

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How to Rent Almost Anything

[Continued from page 134]

that the tool's recoil limbered his shoulder muscles and improved his tennis game.

Rates and rules. The rates given here are *average* rates. But they vary considerably from one location to another, even among stores in the same chain, as overhead and other factors vary. An item that rents for $8 in a large metropolitan area might rent for $3 in a small town.

When you rent a tool like a saber saw or power drill, you use your own bits or blades. Because of the chance of breakage, these items aren't usually rented with the tool. The rule doesn't apply to tough-bladed tools like circular saws, which will be freshly sharpened for you each time.

When you rent a sanding tool, from a little furniture model to a big floor sander, you buy the abrasive paper. The best bet: Buy more than you need right at the rental store, then return what you don't use.

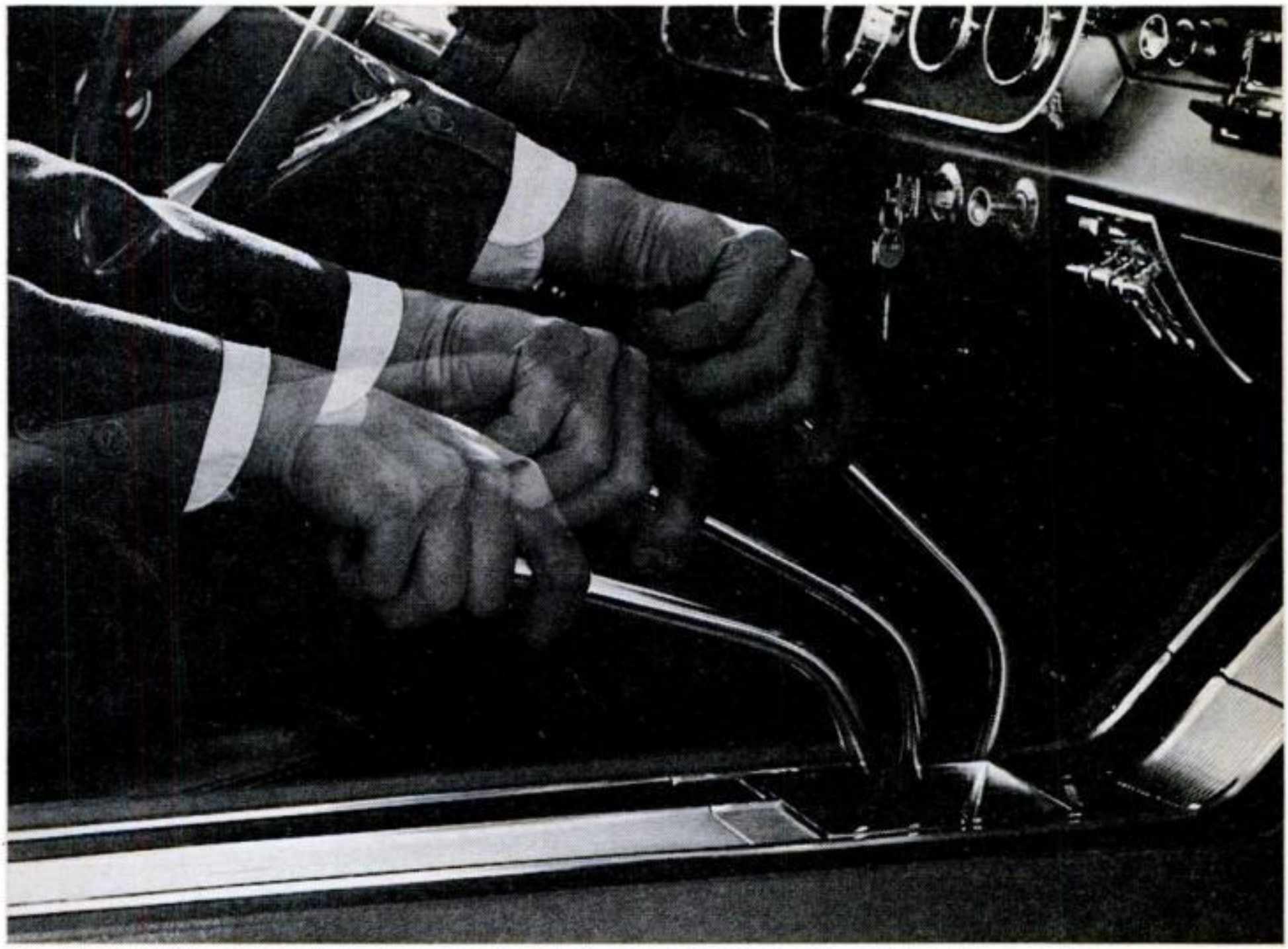
As to deposits, some rental stores require one on certain equipment, some on all equipment, and some not at all. If you return a tool damaged through your own carelessness you'll probably have to pay for the repairs. If the damage results from normal wear, you're in the clear. But as rules vary, check on this at the start.

A good business to get into. If you think the tool-rental business is a good one to be in, you're right. But to get started, you need about $8,000 to $10,000 of your own money and a credit rating that can get you around $30,000 more. If you add up the cost of 600 or more tools, many in the high-price brackets, plus a headquarters, you'll see why. If you don't know anything about the business, you can affiliate with United Rent-Alls and take a free course at the company's training center, 2605 N. 27th St., Lincoln, Neb. Your wife can take the course, too. After that, the firm's records show, you have less than a two-percent chance of failure—compared with 30 percent or worse in many other businesses.

Time was, when you could start small in the rental game. A Van Nuys, Calif., used-car dealer named Sam Greenberg did it back in '39 when he bought five little trailers for $500 and started a business he called Sam's U-Drive. He's still at it today. He'll rent you anything from a screwdriver to that 10-wheel crane. And he's doing all right. With rental yards in four cities, he's grossing $100,000 a month. ■ ■

Urheberrechtlich geschütztes Material

MORE PROOF OF ENGINEERING EXCELLENCE



DOWNSHIFT INTO LOW... YOU'LL WONDER WHERE THE CRUNCH WENT!

VERSATILE FULL-SYNCHRO 3-SPEED MANUAL IS STANDARD ON MOST FORD MOTOR COMPANY CARS.

Once upon a time ordinary manual transmissions "crunched" if you shifted into low on the go, but that was before Ford Motor Company introduced its 3-speed manual transmission, fully synchronized in all forward gears. Now you can shift into "first" without coming to a stop—and no clashing gears! This means extra torque for sharp turns and steep grades. Driving's more fun!

Try it. This finest of manual transmissions is standard on most of our V-8-equipped cars; it's teamed with the new '65 Ford Big-Six engine and available with Falcon Station Buses, Club Wagons and Ford pickup trucks.

Here are quality features you won't find in other manual transmissions. Shot-peened, helically cut gears for improved ruggedness and durability. Antifriction bearings. Precision cast-iron case construction. Extra quality at no extra cost from Ford Motor Company.

FORD-BUILT MEANS BETTER BUILT

Ford

MUSTANG • FALCON • FAIRLANE • FORD
COMET • MERCURY
THUNDERBIRD • LINCOLN CONTINENTAL

RIDE WALT DISNEY'S MAGIC SKYWAY AT THE FORD MOTOR COMPANY PAVILION, NEW YORK WORLD'S FAIR

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Clip out and save

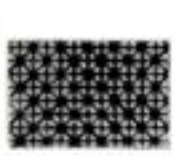
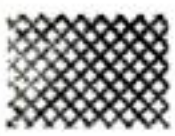
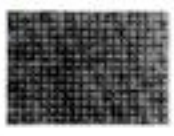
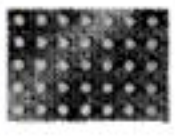
A COMPLETE GUIDE TO DO-IT-YOURSELF ALUMINUM

Complete. A handy at-home reference listing for Do-It-Yourself Aluminum. The variety and types of pieces available, the different sizes, styles, suggested retail prices—plus a complete listing of current project booklets and plans. We think you'll find it a valuable and handy work-saver in your shop.

REYNOLDS DO-IT-YOURSELF ALUMINUM
can be worked with ordinary woodworking tools

REYNOLDS DO-IT-YOURSELF ALUMINUM SHEET

Plain, perforated and embossed

	Item No.	Description	Suggested Retail Price
	1	Plain aluminum sheet 36″ x 36″—.020″	$2.99/sheet
	111	Plain aluminum sheet 36″ x 36″—.040″	6.89/sheet
	125	Plain aluminum sheet 32″ x 33″ (approx)—.008″ (thin sheet)	.98/sheet
	34	Union Jack sheet 36″ x 36″—.025″	2.99/sheet
	126	Union Jack sheet 32″ x 33″ (approx)—.008″ (thin sheet)	1.49/sheet
	31	Cloverleaf sheet 36″ x 36″—.025″	2.99/sheet
	127	Cloverleaf sheet 32″ x 33″ (approx)—.008″ (thin sheet)	1.49/sheet
	33	Lincane sheet 36″ x 36″—.020″	2.99/sheet
	133	Hexcane sheet 36″ x 36″—.040″	6.89/sheet
	2	Leather Grain embossed sheet 36″ x 36″—.020″	2.99/sheet
	27	Wood Grain embossed sheet 36″ x 36″—.020″	2.99/sheet
	28	Square embossed sheet 36″ x 36″—.020″	2.99/sheet
	128	Moresque sheet 32″ x 33″ (approx)—.008″ (thin sheet)	1.49/sheet

DO-IT-YOURSELF ALUMINUM ROD & BAR

Can be cut, drilled, sawed, filed and shaped. Needs no painting for protection (yet takes to paint beautifully).

Item No.	Description	Suggested Retail Price
3	⅜″ x 6′ Rod	$1.29/length
3-A	⅜″ x 8′ Rod	1.72/length
4	½″ x 6′ Bar	1.69/length
4-A	½″ x 8′ Bar	2.25/length
5	¼″ x 6′ Bar	1.98/length
5-A	¼″ x 8′ Bar	2.64/length
96	6′ T-Section	1.79/length
96-A	8′ T-Section	2.39/length

REYNOLDS DO-IT-YOURSELF ALUMINUM TUBING

Rustproof and corrosion resistant. Ideal for outdoor furniture, table and chair legs, support poles, etc.

Item No.	Description	Suggested Retail Price
8	¾″ x 6′ Tubing	$1.79/length
8-A	¾″ x 8′ Tubing	2.39/length
9	1″ x 6′ Tubing	1.89/length
9-A	1″ x 8′ Tubing	2.52/length
10	1¼″ x 6′ Tubing	1.99/length
10-A	1¼″ x 8′ Tubing	2.65/length
42	¾″ End Plugs	.05/plug
43	1″ End Plugs	.05/plug
44	1¼″ End Plugs	.05/plug
48	¾″ Flange	.49/each
49	1″ Flange	.49/each
50	1¼″ Flange	.50/each
51	¾″ T-Butt	.49/each
52	1″ T-Butt	.49/each
53	1¼″ T-Butt	.50/each
54	¾″ 90° Elbow	.60/each
55	1″ 90° Elbow	.65/each
56	1¼″ 90° Elbow	.85/each
77	Oval Embossed Tubing	1.89/length
78	Hexagonal Embossed Tubing	1.89/length
88	¾″ Splicer for Round Tube	.60/each
89	1″ Splicer for Round Tube	.65/each
90	1¼″ Splicer for Round Tube	.85/each
91	¾″ Adjustable Elbow	1.19/each
92	1″ Adjustable Elbow	1.29/each
93	1¼″ Adjustable Elbow	1.39/each
104	1″ x 6′ Square Tube	1.98/length
114	⅜″ Coiled Tubing—25′	2.89/coil
185	⅜″ x 6′ Tubing	2.19/length

Items 8, 9 and 185 Telescope

Urheberrechtlich geschütztes Material

REYNOLDS DO-IT-YOURSELF ALUMINUM ANGLES

Including hinges, sliding door track, corner posts and H-sections. Easy-to-use, saves time, work and money for a thousand different jobs.

Item No.	Description	Suggested Retail Price
6	1/4" x 6' Angle	$1.99/length
6-A	1/4" x 8' Angle	2.65/length
7	1/8" x 6' Angle	1.79/length
7-A	1/8" x 8' Angle	2.39/length
B-14	1" x 1" x 1/8" x 8' Angle	3.15/length
B-15	3/4" x 3/4" x 1/16" x 8' Angle	1.59/length
67-S-4	4' Track Set for 1/8" Materials, including fasteners	2.49/set
67-S-6	6' Track Set for 1/8" Materials, including fasteners	3.39/set
68-S-4	4' Track Set for 1/4" Materials, including fasteners	2.98/set
68-S-6	6' Track Set for 1/4" Materials, including fasteners	3.98/set
72	6' Track for 7/16" Materials and Aluminum Frames	2.98/length
95-S-4	4' Track Set for 1/2" Materials, including fasteners	3.39/set
95-S-6	6' Track Set for 1/2" Materials, including fasteners	4.78/set
101	8' Corner Post, 1/4" Materials	3.19/length
102	8' Corner Post, 1/2" Materials	4.29/length
103	8' Corner Post, 3/4" Materials	5.39/length
105	8' H-Section, 1/4" Materials	2.69/length
106	8' H-Section, 1/2" Materials	3.19/length
107	8' H-Section, 3/4" Materials	3.88/length
108	72 1/2" x 1 1/4" Continuous Hinge	3.39/length
112	8' Corner Post, 3/8" Materials	3.88/length
113	8' H-Section, 3/8" Materials	2.98/length
117	8' U Section for 1/4" thick panels	1.98/length
118	8' U Section for 3/8" thick panels	1.98/length
119	8' U Section for 1/2" thick panels	2.49/length
120	8' U Section for 3/4" thick panels	2.49/length
161	1/2" x 6' Angle	1.19/length
161-A	1/2" x 8' Angle	1.59/length

ALUMINUM FASTENERS, WIRE, MISCELLANEOUS

Item No.	Description	Suggested Retail Price
16	6' Brace	$0.79/length
16-A	8' Brace	1.05/length
21-B	10—24 x 1/2" Round Head Machine Screws and Nuts	.25/bag
21-C	10—24 x 3/4" Round Head Machine Screws and Nuts	.25/bag
21-D	1/4"—20 x 1" Round Head Machine Screws and Nuts	.25/bag
21-E	1/4"—20 x 1 1/2" Round Head Machine Screws and Nuts	.25/bag
21-G	6 x 3/8" Pan Head Self-Tapping Screws	.15/bag
21-H	6 x 1/2" Pan Head Self-Tapping Screws	.15/bag
21-I	8 x 1/4" Pan Head Self-Tapping Screws	.15/bag
21-M	3/32" x 1/4" Brazier Head Rivets	.15/bag
21-N	1/8" x 3/8" Brazier Head Rivets	.15/bag
21-O	1/8" x 3/4" Brazier Head Rivets	.15/bag
21-P	1/4"—20 x 2 1/4" Slotted Rd. Head Machine Screws and Nuts	25/bag
21-Q	1/4"—20 x 1/2" Slotted Rd. Washer Head Machine Screws and Nuts	.25/bag
21-R	#6 x 3/8" Slotted Flat Head Type "A" Self-Tapping Screws	.15/bag
21-S	#8 x 1/2" Slotted Flat Head Type "A" Self-Tapping Screws	.15/bag
21-T	#10 x 5/8" Slotted Flat Head Type "A" Self-Tapping Screws	.15/bag
21-U	#10 x 3/8" Pan Head Type "A" Self-Tapping Screws	.15/bag

ALUMINUM FASTENERS, WIRE, MISCELLANEOUS (Continued)

Item No.	Description	Suggested Retail Price
21-V	#6 x 1/2" Slotted Flat Head Type "A" Self-Tapping Screws	.15/bag
21-W	#8 x 3/4" Slotted Flat Head Type "A" Self-Tapping Screws	.15/bag
21-X	#8 x 1" Slotted Flat Head Type "A" Self-Tapping Screws	.15/bag
818-P	2 1/2" Spiral Grip Roofing Nails	.25/bag
819-P	1 3/4" Screw Grip Roofing Nails	.25/bag
828-P	10d 2 3/8" Plain Wood Siding Sinker Head Nails	.25/bag
850-P	4d 1 1/2" Plain Common Nails	.15/bag
47	Corner Braces	.08/set
85	Complete Soldering Tool and Accessories	1.98/set
86	3 Refill Brushes for Soldering Tool	.49/set
87	Solder 4 pieces of solder per skin-packed card	.59/card
97	Picture Frame	1.89/length
109	Craft Wire—60' .035" Gauge	.29/each

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Item No.	Description	Suggested Retail Price
30	6' Storm Sash	$1.14/length
30-A	8' Storm Sash	1.49/length
30-S	Storm Sash Glazing Spline 150' reel	.04/foot
25	Corner Locks	.44/set
26	Screen Hangers	.39/set
37	Interchangeable Hangers	.98/set
38	Splicer for Items #24 and #30	.10/each

SCREEN MATERIALS

Item No.	Description	Suggested Retail Price
24	Screen Frame Section with Aluminum Spline—6'	$1.14/length
24-A	Screen Frame Section with Aluminum Spline—8'	1.49/length
38	Splicer for Items #24 and #30	.10/each
16	6' Brace	.79/length
16-A	8' Brace	1.05/length

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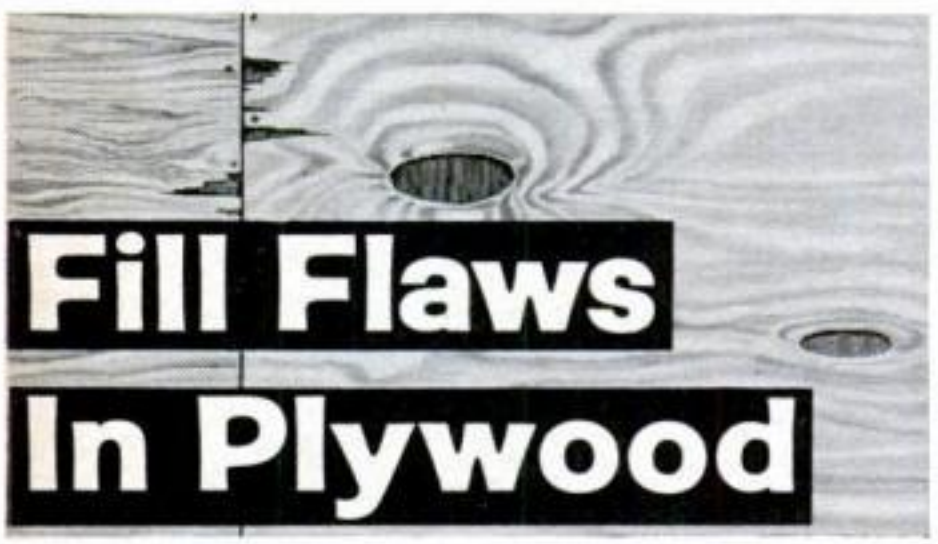

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PLASTIC WOOD
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[Continued from page 69]

red broilers, coffee dispensers, and spice cabinets. Even the most luxurious space cuisine for long-duration voyages, however, will avoid needless food wastes: All meat will be boneless and free of undesirable fat; potatoes will be peeled in advance; cherries will be stoneless. If a Martini is ever served aboard a spacecraft, it may come without an olive.

Foiling a steak's escape. Ingenuity will be required of designers of tableware for gracious dining under zero gravity. Dishes will need spring-loaded covers so a steak won't float away. (And, of course, the dishes themselves must somehow be anchored.) Forks are fine, but spoons are useless. Knives either will use saw action to minimize cutting pressure, or will be replaced by scissor-type devices that can do without any one-sided pressure.

Tools for use under zero gravity will have special designs, too. If a weightless astronaut tried to tighten a nut with an ordinary wrench, the effort would only spin him around. Instead, he'll use a "squeeze wrench" that does not require a firm foothold to apply a twist.

Cleanliness is the key to good housekeeping, in space as at home. And, under zero gravity, rigorous cleanliness is even more important than at home. Once up in orbit and under zero-gravity conditions, any dust or dirt in a spacecraft would not harmlessly settle under a chair or on a rug. It would float around—and could be inhaled, or short-circuit electrical terminals, or be sucked into the air-conditioning system. That's one good reason why zwieback wouldn't be popular in a spacecraft.

Tidiness starts early. The spacecraft is assembled and checked out under "white-room conditions" comparable to the cleanliness standards of a hospital operating room. Even when perched on top of the huge launch rocket prior to takeoff, it is surrounded by a servicing room operated under white-room standards. After the astronauts leave their specially equipped Transfer Van, they ride up a spic-and-span elevator to that servicing room, located on the top floor of the gantry. Before entering the spacecraft they remove special shoe covers. All these precautions are to prevent any dirt or dust from getting into the craft at any time before takeoff.

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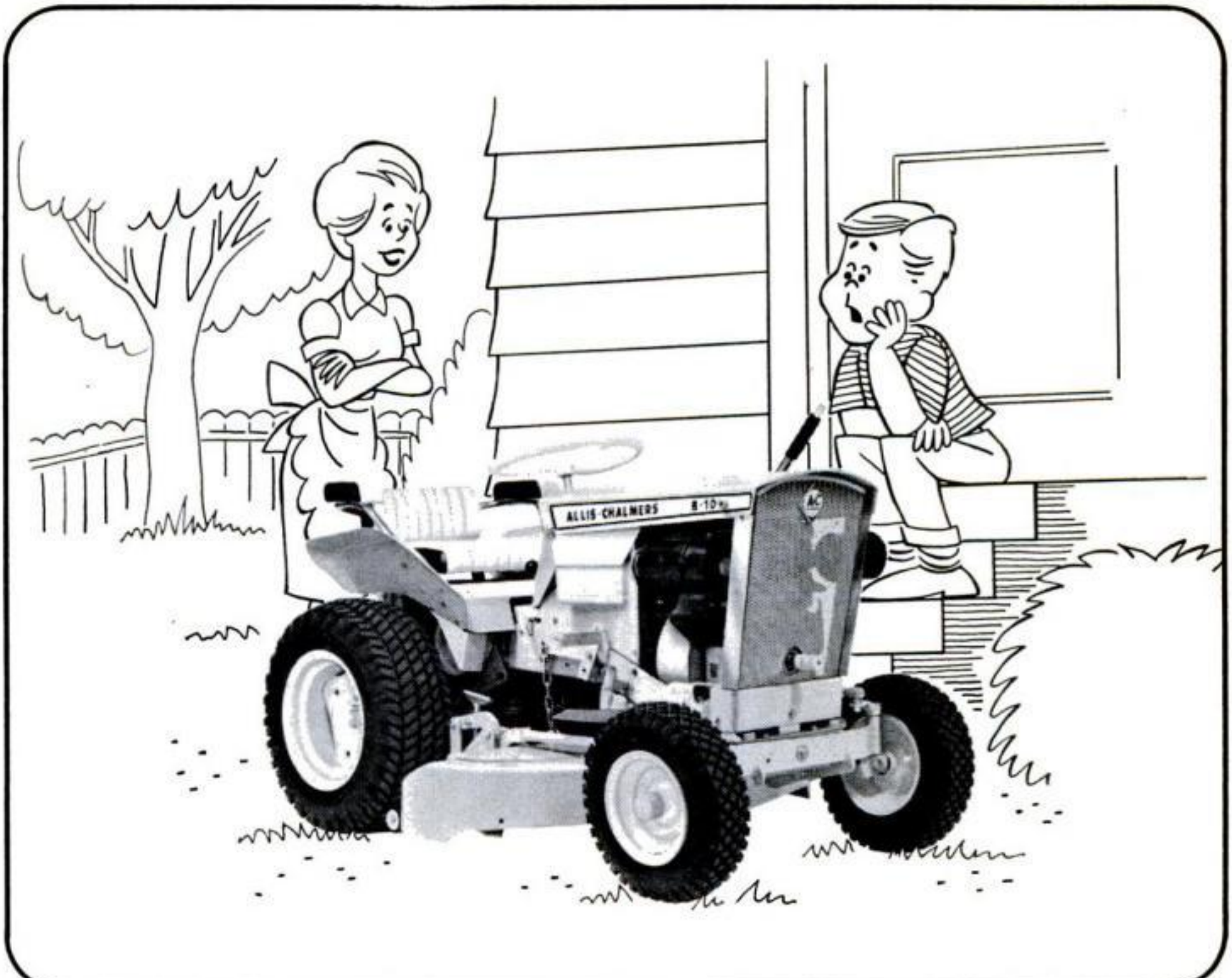

Why doesn't grass grow faster, Mom?

Looks like another case of B-10 Tractor Fever. Dad's got it, too. He used to head for the golf course first thing Saturday morning. Now he heads for the B-10. Has to beat Junior. Still has plenty of time for his regular 18 holes afterward. But Dad's a nice guy. He leaves a little for Junior.

Warning: B-10 Tractor Fever is catching. They even caught Mom clearing snow off the driveway a few times last winter with the B-10. She thought nobody was looking.

That's the one trouble with the B-10. It's too much fun. 'Cause it's a *real* tractor. From Allis-Chalmers, the tractor people who make the big ones. Practical too. Dad's recommending one for the plant.

I think I'm getting the fever too. Please send me the booklet that tells how to cure it.

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Mark 75-75A-78-78A-600		13⅛ x 15	PM-78	17.00
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650-700-800-850-900 R.H. Props (Gear Shift)	1962-65	13⅛ x 19	PM-800	17.00
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The Strange World of Zero Gravity

Any loose tools or pieces of special equipment used within the spacecraft must have their proper storage spaces or tie-up straps. A monkey wrench, harmlessly floating in a corner of a spacecraft for weeks of zero gravity, can turn into a deadly missile the moment the rocket engines are turned on, or the decelerated reentry into the atmosphere begins.

So far we have discussed zero-gravity problems that can be foreseen quite clearly. We cannot yet speak with equal assurance about the most important one of all:

Man, the question mark. A great deal has been written and speculated about man's ability to live and perform under zero gravity over extended periods of time. To date, we know this much:

Our Mercury and Gemini astronauts have experienced many hours of weightlessness in their orbital flights. Leroy Gordon Cooper, who circled the earth for more than 34 hours on May 15 and 16, 1963, performed a brilliant manual reentry maneuver at the end of his 22-orbit flight—demonstrating convincingly that his effectiveness and precision had not suffered one bit. Soviet astronauts have returned from orbital flights lasting up to 95 hours, apparently likewise without detrimental effects. There is no substance whatever to the widespread rumors that one or more of our astronauts are still suffering from ill after-effects of weightlessness experienced during their flights.

Nevertheless it would be rash to say that extended zero gravity could pose no serious physiological problems. In flights aimed at a landing on the lunar surface, firmly scheduled for this decade, our Apollo astronauts will be under zero gravity, on and off, for periods of up to 10 days. Only in some of our forthcoming Gemini flights do we expect to learn what such longer periods of weightlessness will do to the crew and its ability to perform with dispatch and precision.

Meanwhile we can assume that, to retain their physical fitness during extended space flights, astronauts will need equipment for regular physical exercise—and this will be easy to provide. Sporting-goods stores are full of exercisers, ranging from simple stretch belts to elaborate rowing and pedaling machines, that will lend themselves well to use under zero gravity in outer space. ■■

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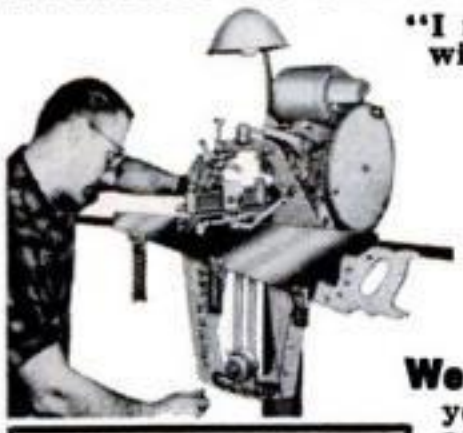

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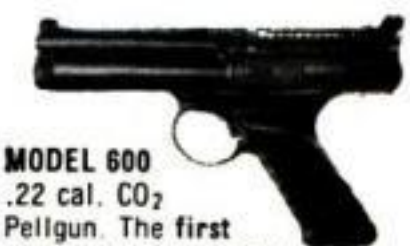

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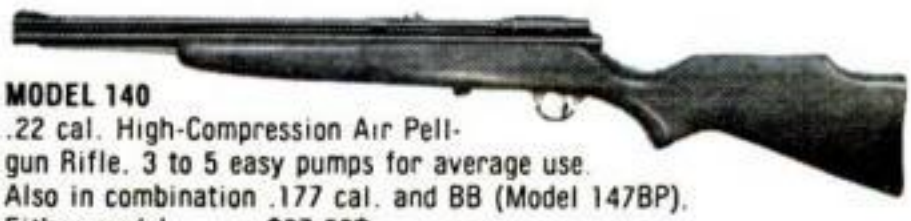

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The Dope-Smuggling Diplomats

[Continued from page 103]

Confessions quickly followed, with substantial jail sentences handed down by a federal court: 15 years each for Rosal and Calamaris, and nine each for Tarditti and Bourbonnais. In France, Barnier and Le Coat drew five-year sentences. Of the entire ring, only Gilbert Coscia eluded the net.

Rosal's arrest, however, hadn't completely plugged the diplomatic-courier pipeline through which narcotics flowed into the U.S. from France. In our efforts to track down Gilbert Coscia, our Bureau and the French Sûreté found that he and his accomplices had "continuation insurance." They had lined up a *second* diplomat.

This time, with help from the Sûreté and the Royal Canadian Mounted Police, we were able to focus on the then Mexican Ambassador to Bolivia, Salvador Pardo-Bolland, as our prime suspect.

Diplomat on the loose

We traced Pardo-Bolland to Cannes, on the French Riviera. He was there on a fraudulent Mexican passport identifying him as Suarez Lorenzo de Mendoza. After we had him under surveillance, we saw him talking with Juan Arizti, the Uruguayan Ambassador-Designate to Colombia. Then we saw the pair meet with the fugitive Gilbert Coscia and another French narcotics trafficker, Baptiste Giacobetti.

The new coalition tried a decoy. In mid-February, 1964, they sent Pardo-Bolland to New York with two suitcases full of liquor and paperback books. Earlier, imagining they would throw us off the scent with the ruse, they had Arizti go to the Nice airport with his own two bags and pick up four more at the checkroom there. These four bags Arizti took by air to Montreal.

One of our agents flew beside Arizti in the plane to Montreal. At the airport, Arizti used his diplomatic passport to get the bags through Canadian customs without a search. Then he took a taxi (with our agents right behind him) to the Canadian National Railroad Station. There Royal Canadian Mounties, disguised as floor sweepers, watched Arizti store the bags in lockers.

With a writ of assistance, the Mounties opened the lockers, had their lab do a fast analysis on the plastic bags of white powder to make sure it was heroin. They replaced all but about a quarter-pound in each suitcase with ordinary flour. Next day, our own

CONTINUED

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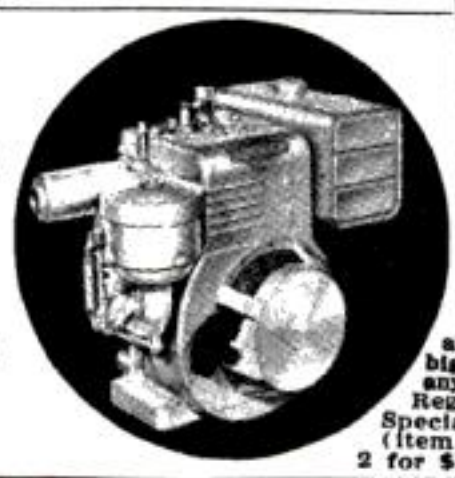

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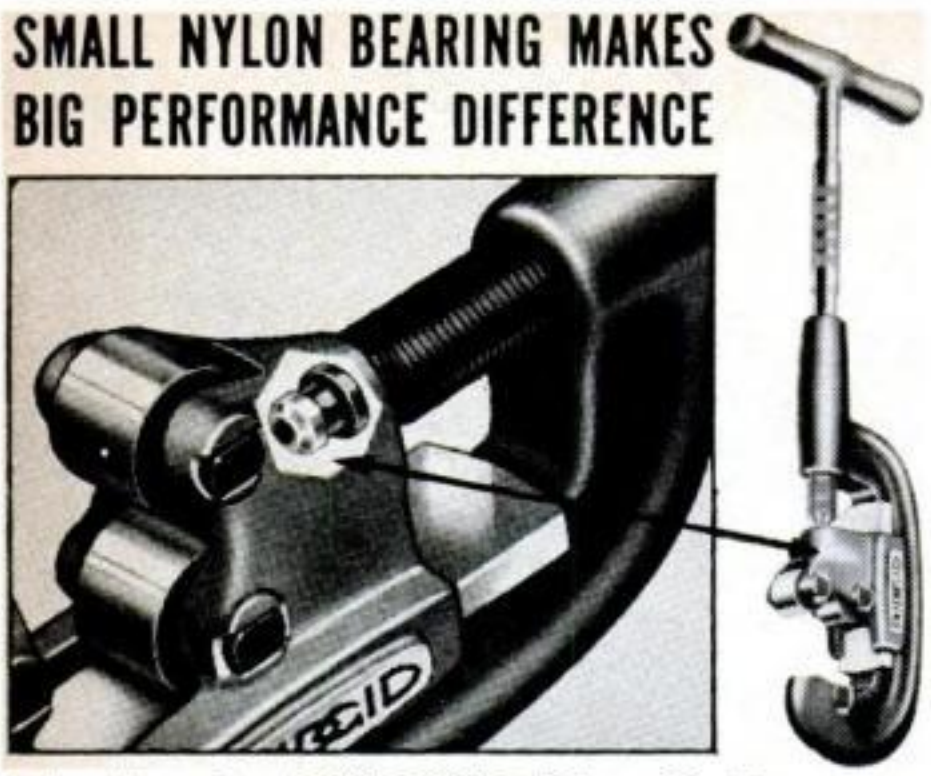

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men and the Mounties watched Arizti lug his bags into a train bound for New York.

We gave this courier the red-carpet treatment on his arrival in New York. We made movies of everything he did. One of our agents in redcap disguise took his luggage and, at Arizti's request, put it in the baggage room. The man who received the bags was also an agent.

Our agent-redcap saw to it that the cab Arizti got into was one driven by a narcotics agent, so we had no problem finding out that he was staying at the Elysee Hotel. This was the same hotel the ring had picked for Pardo-Bolland.

Arizti turned the baggage checks over to Pardo-Bolland. Coscia phoned Pardo-Bolland from Nice and told him to get those baggage checks to a Jean Le Roux staying at the Hotel Americana (and under surveillance).

Closing the net

Our agents recognized Le Roux as a notorious French hoodlum whose real name was René Bruchon. Just outside the Americana, Bruchon met a narcotics delivery man —an associate of convicted traffickers. As our agents watched, they argued about the payoff price, then broke off the talks.

Soon, telephone calls to Bruchon from Switzerland told him to alert Arizti and Pardo-Bolland, and get out of the United States at once. Almost in lock step with our agents, they went to Swissair for tickets.

Agents followed Bruchon and saw him drop a set of keys into a street trash basket. We promptly retrieved them, tried them on the locks of Arizti's bags. They all worked.

It was time to move in. Our weary New York detail scooped up the two diplomats, their French gangster contact, and his two New York bagmen in a beautifully coordinated grab. Abroad, the Sûreté took Coscia and Giacobetti at the same time.

Pardo-Bolland, who lost diplomatic immunity by booking passage back to Europe on Swissair instead of continuing on to Mexico, won from his country the same prompt disavowal that Rosal had received from his. He went to jail for 18 years. Uruguay gave the same abrupt kiss-off to Arizti, who drew a sentence of 10 years. Coscia and Giacobetti come to trial soon.

The two cases yielded 354 pounds of pure heroin worth, conservatively, $33 million on the illicit market. ■ ■

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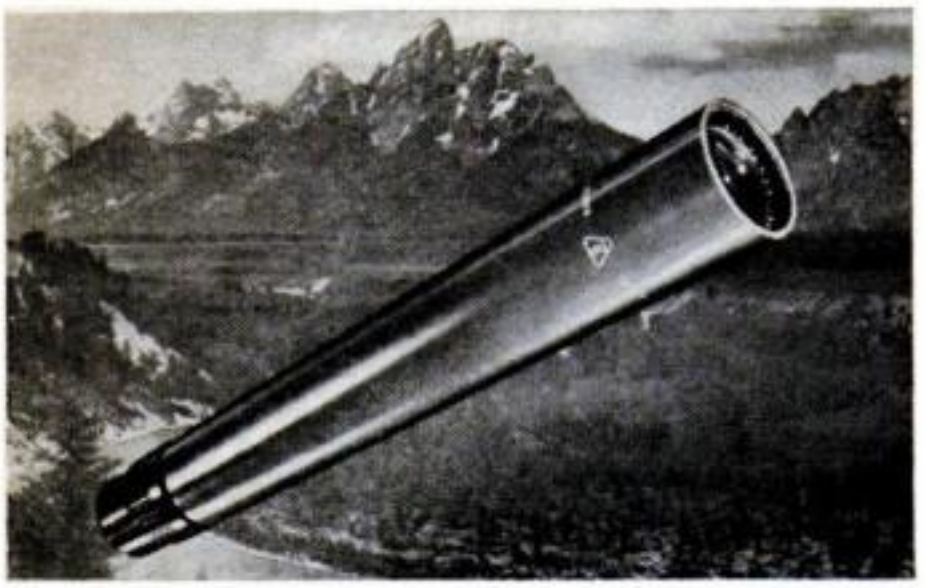

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[*Continued from page 54*]

modified to take the new perforations. The large image called for a new optical system and new lamps. So the lamp manufacturers had to be brought in.

Because the image is larger, the designers shortened the focal length of the projection lens to keep the projected image down around the old 8mm size.

The engineers had to make sure, too, that you wouldn't try to put your old reels on a Super 8 projector and thus tear up the film. They did this by increasing the size of the Super 8 reel center hole: ½ inch against 5/16 inch for standard 8mm. If you're stubborn and still try to force on an old 8mm reel, the sprockets will just push the film out of the way.

The competition. Other manufacturers have been going through exactly the same processes of designing, testing, and getting into production. Argus, also based in Chicago, has come up with a line of five Super 8 cameras, ranging from the economy Model 810 to the Showmaster Model 822, which has reflex viewing and electric zoom, can take slow-motion pictures, and even shoot a frame at a time. One handsome design feature on the Argus: a folding pistol grip that snaps back under the camera. Another good feature: Indicators in the viewfinder show the *f* stop and position of the built-in filter. And Argus gives a one-year guarantee, even against accidental damage.

Keystone and DeJur will also be in there. Keystone's top camera will be the Auto-Instant Model K-625, with power zoom, behind-the-lens CdS electric eye, built-in A filter, and through-the-lens viewing.

DeJur comes on strong with three Super 8 cameras, five projectors. Two projectors, the Versatile models, will take either Super 8 or standard. *That's* smart design!

From overseas, the first announced Super 8 camera is the Bauer C-1. It has electric drive, through-the-lens viewing, a zoom range of 9mm to 36mm, and three film speeds: 13, 18, and 24 frames per second.

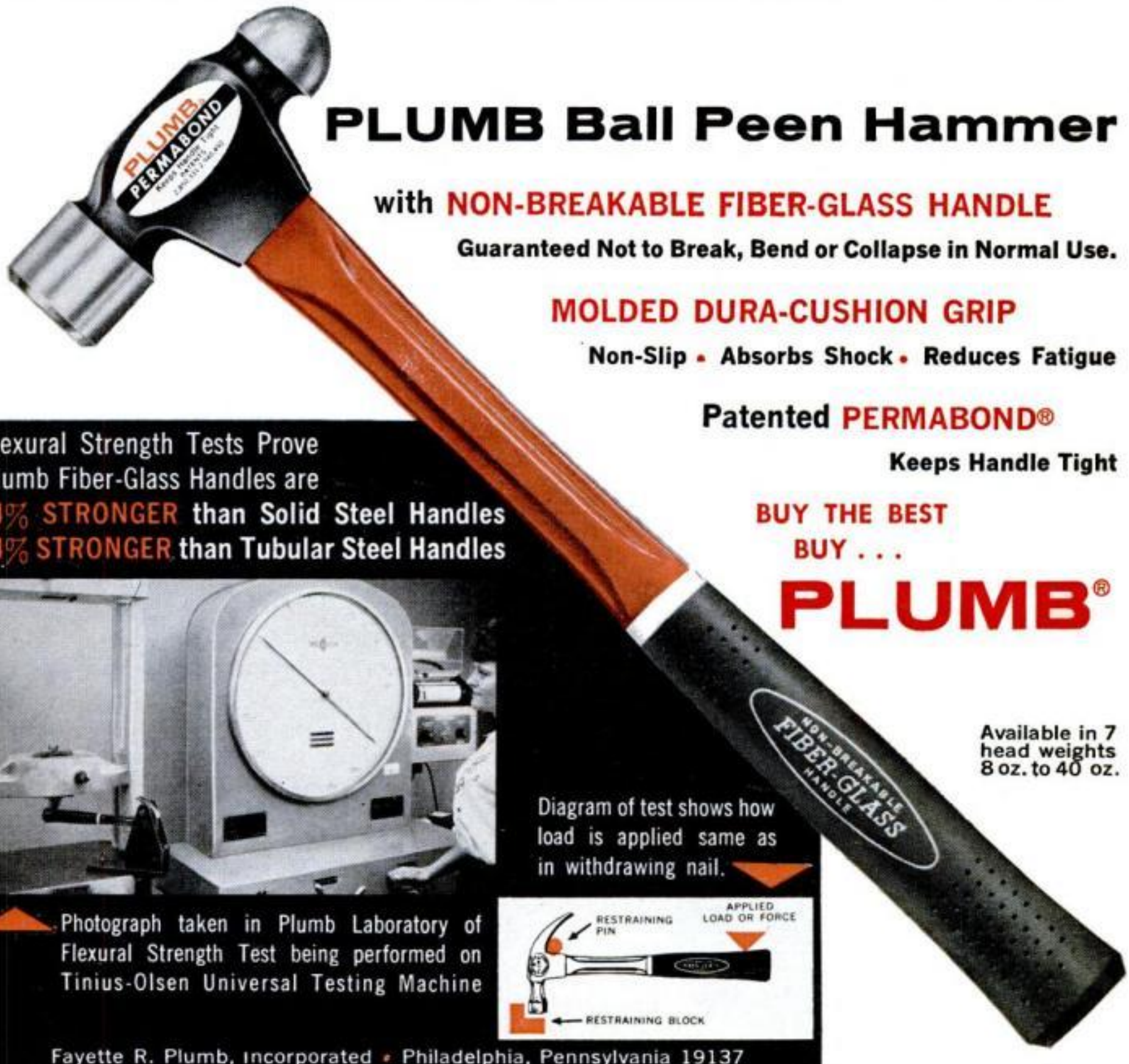
In Chicago, I watched the first production models coming off the Bell & Howell line. By the time you read this, they'll be in your camera store, ready to start that new revolution in 8mm movies in your home. So will models from all the other manufacturers—and you'll be able to judge how each of them fared in the great Super 8 design race. ■ ■

Urheberrechtlich geschütztes Material

[Continued from page 165]

the transmitter. That's why you should treat an antenna as an integral part of a CB transceiver, not an accessory. Here's what you should know about antennas:

- Whip antenna—the workhorse antenna of mobile CB. To be effective, a simple whip should be ¼ of a wavelength long—about nine feet—and should be mounted over a good electrical ground.
- Loaded whip—to shrink the length of a regular whip, so it is practical for hand-held and cab-mounted use, a loading coil can be added somewhere along the whip's length. It's somewhat less efficient than a longer unloaded whip, but it works.
- Ground plane—the most popular fixed antenna type. It's essentially an unloaded whip mounted directly above three or four radial elements. The radial elements create an artificial electrical ground. The ground plane radiates most of the transmitted power parallel to the earth's surface; little power is radiated skywards and wasted.
- Beam antenna—rotary beam antennas are becoming more and more popular. They focus the transmitter power sharply in one direction, effectively increasing it. Since they present certain problems in communicating with mobile stations in motion—they must be continually redirected toward the vehicle—they find their greatest application in communications between fixed stations.
- Coaxial antenna—another popular fixed antenna that radiates most of the transmitted power parallel to the ground. It's not as efficient as a ground plane, but it is easier to mount in crowded places since it is much more slender. ■ ■



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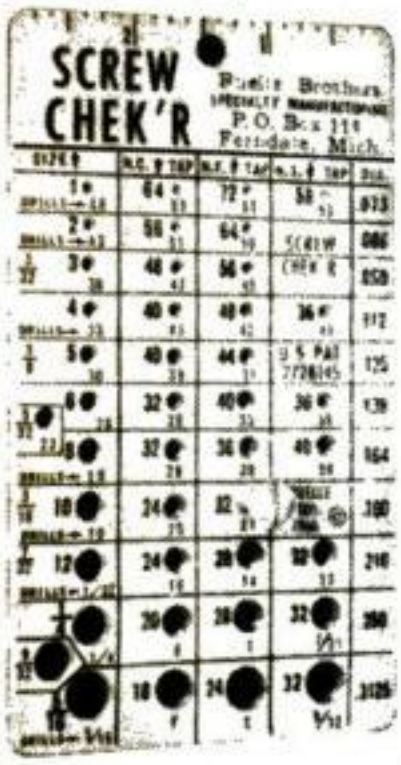

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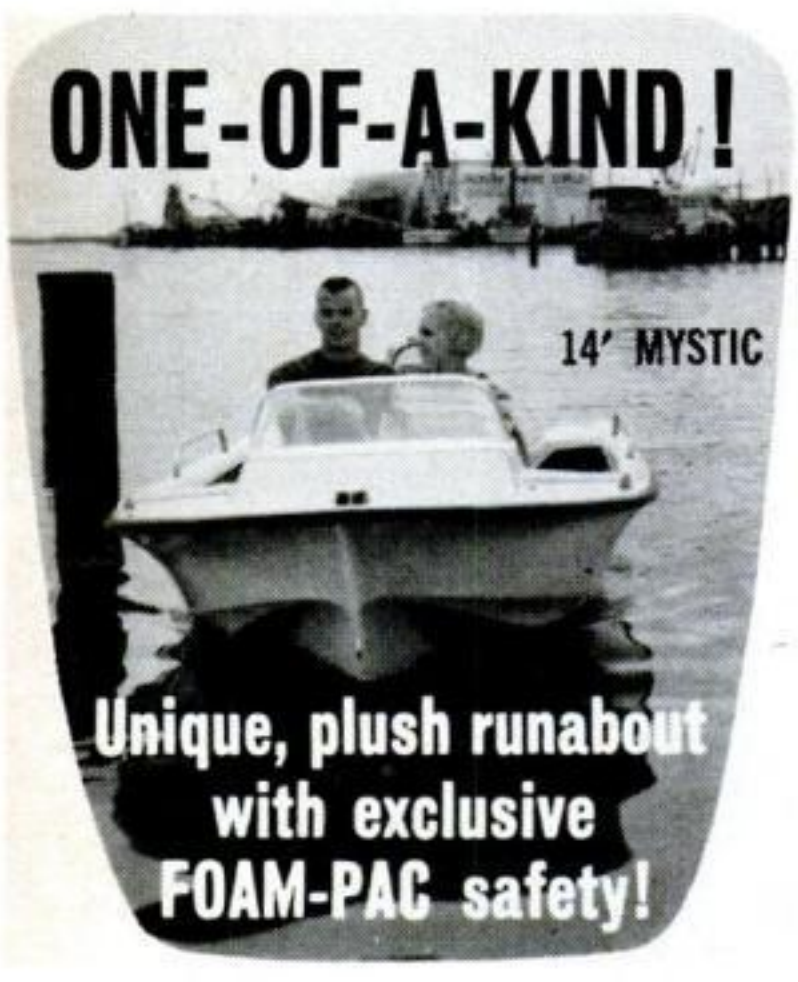

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[Continued from page 75]

Caracas, Venezuela. In addition, $75 per month is placed in an account for you and paid in a lump sum of $1,800 when you complete your two-year tour of duty.

What's it like? Eugene Schreiber of St. Louis is a graduate engineer and was in the first Peace Corps contingent shipped overseas. He was assigned to Tanganyika.

"I was a little afraid the first few nights in Africa, but there's no danger," he says. Schreiber's job was teaching foremen and inspectors of the Tanganyika Department of Public Works elementary civil engineering and the practical aspects of road building.

He lived in good clean housing at the school and had $170 a month to spend. For relaxation, he swam at a nearby beach, and during his 45 days of leave he traveled extensively through the country.

Today Schreiber is an aide to Peace Corps director Sargent Shriver. He's also studying law at George Washington University in Washington, D.C. for a career as a foreign-service officer.

Neil Lang, a fledgling architect of Seekonk, Mass., worked in Tunisia and helped plan a 1,700-unit housing development. At first he was "overwhelmed by the responsibility." But he adds, "I couldn't have duplicated the experience in the United States."

Future earning power? Burt Swanson of Princeton, Ill., worked with farmers in Cyprus to help them devise better ways to irrigate their crops, until the island's civil war forced him to leave. His problem on returning to the U.S. was that "there were too many opportunities to choose from. I feel I've increased my lifetime earning power by at least 50 percent."

The Peace Corps doesn't guarantee any improvement in future earning power, but service does open new opportunities. Many colleges award academic credit for Peace Corps experience, and more than 1,000 scholarships are available to former volunteers. The federal government credits Peace Corps service to the seniority of any government employee.

Private industry is also becoming increasingly interested in former Corpsmen. IBM president Thomas J. Watson says that volunteers who complete their service are "particularly employable." They have demonstrated the ability to do tough jobs under difficult circumstances, and "there are never enough people of this kind available." ■ ■

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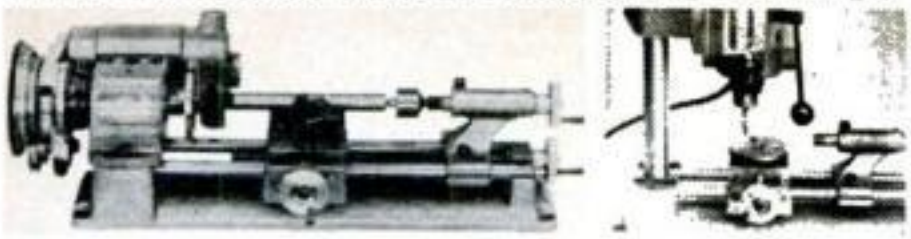

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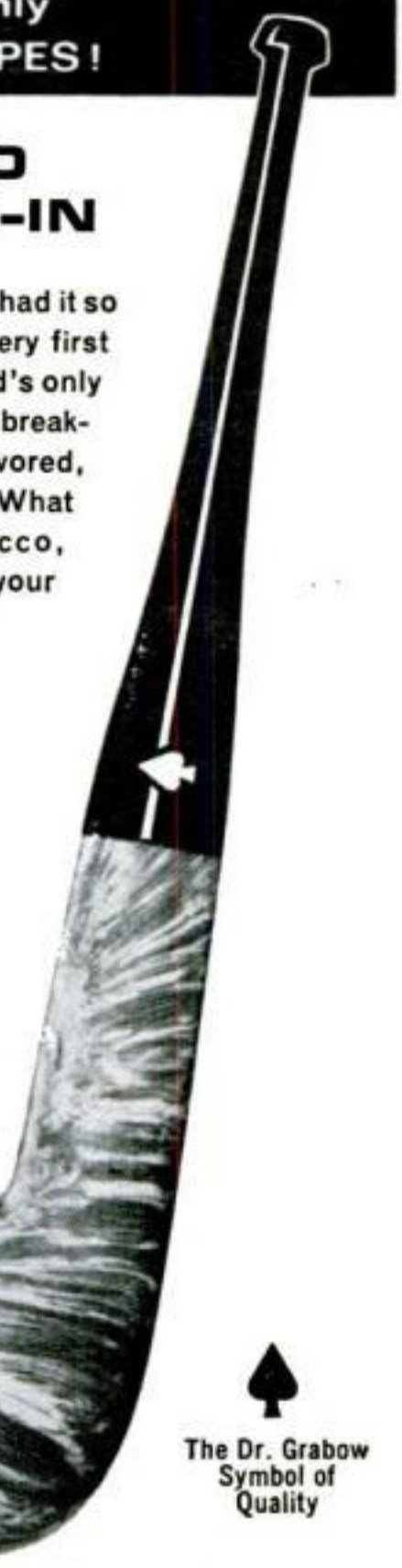

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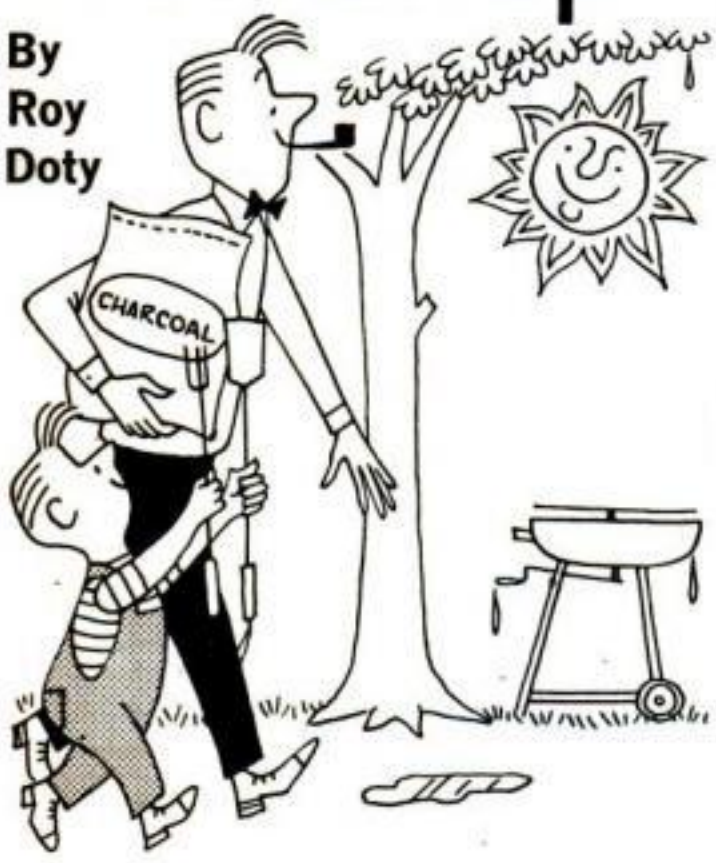

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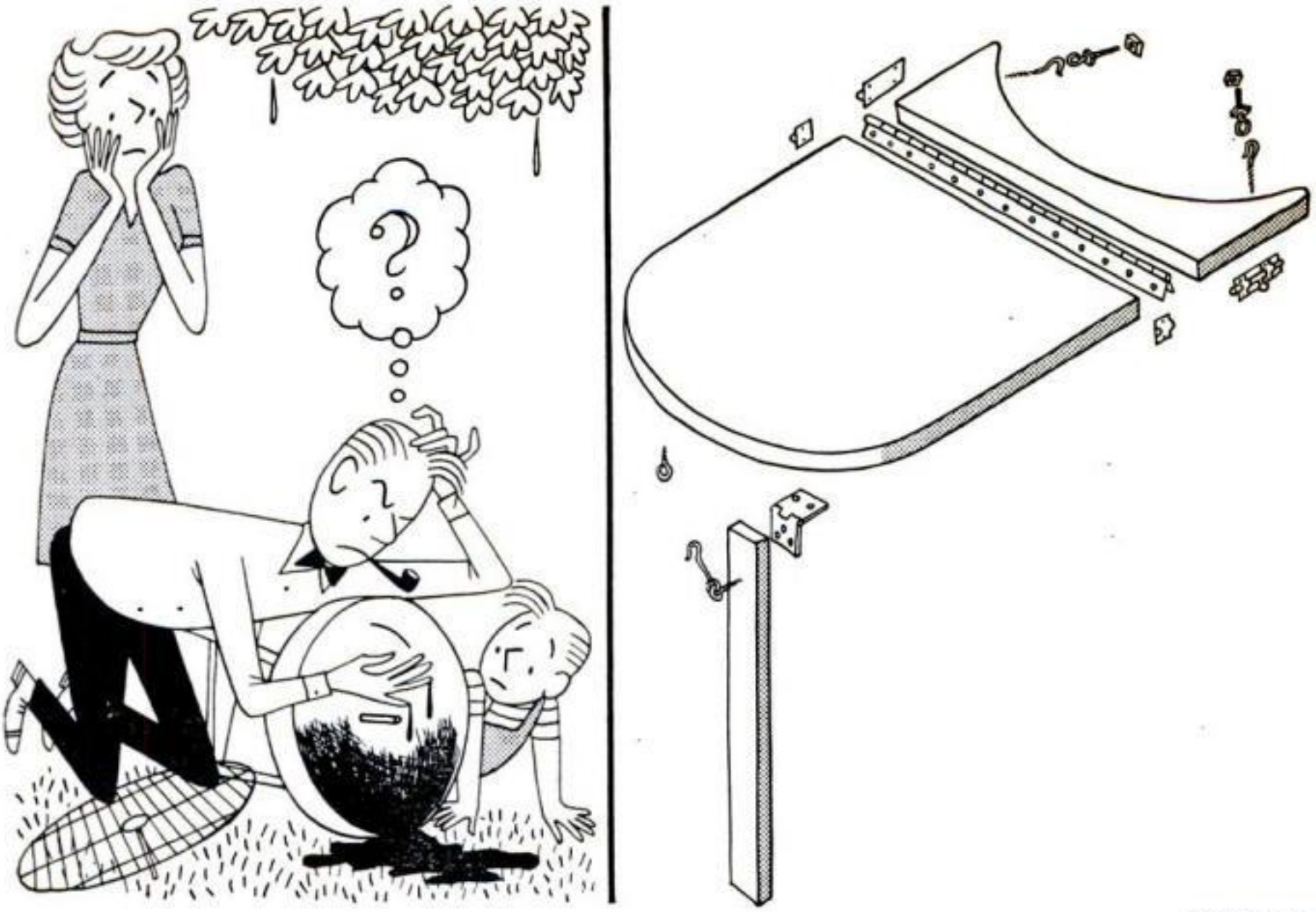

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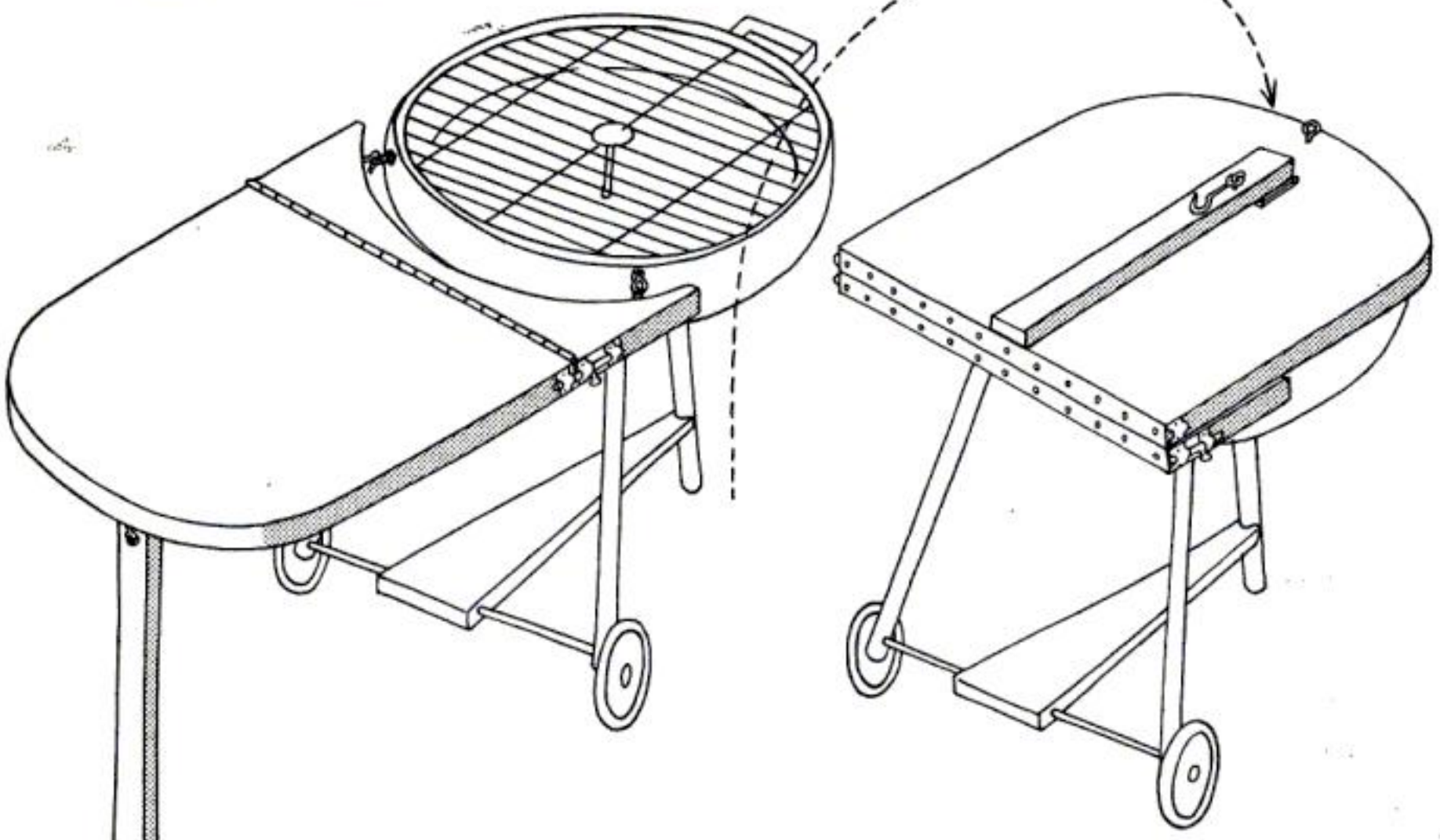

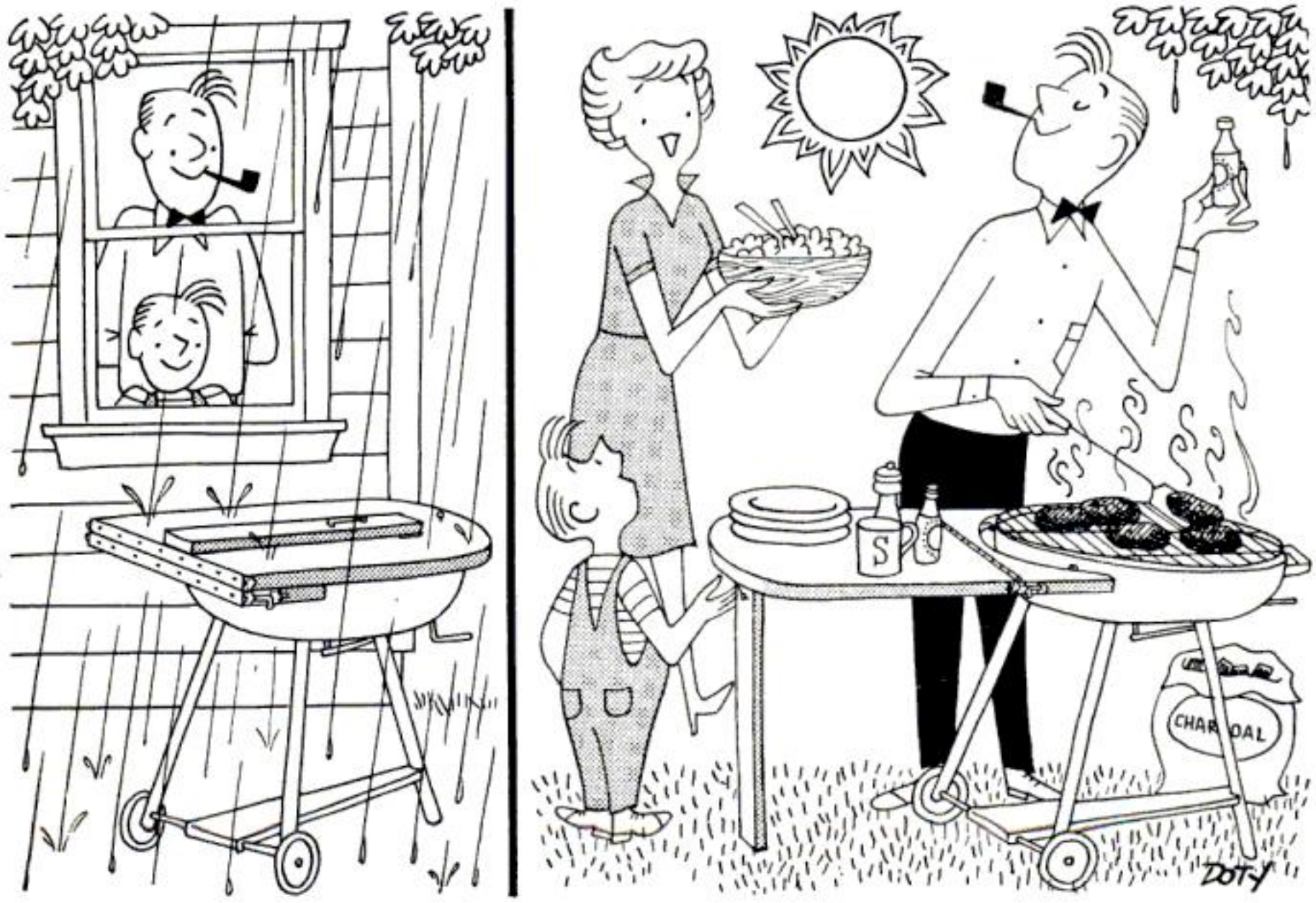

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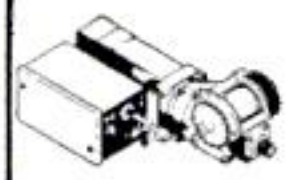

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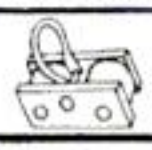

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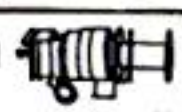

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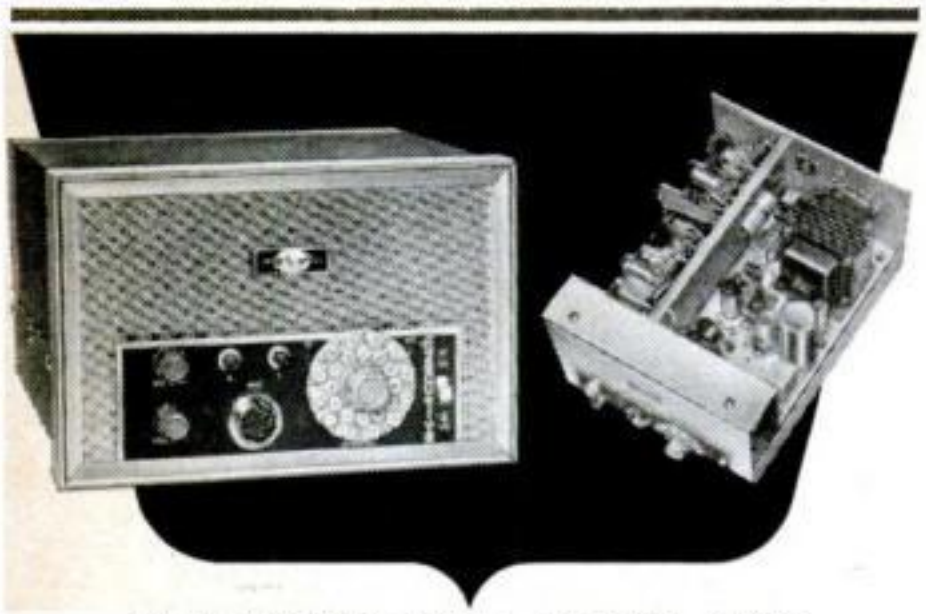

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[Continued from page 61]

the male roach believe he's following a female roach and proceed to extermination.

The aroma experts receive some strange requests. One company recently received a plea from an Oklahoma rancher for the odor of rattlesnake, which could be applied to corral posts to keep horses away. Regretfully the order could not be filled.

The Chicago White Sox baseball team has asked several of the scent companies to develop an irresistible aroma of freshly buttered popcorn, a big profit maker in ballparks. But an artificial popcorn aroma is still not here to compete with the natural fragrance appeal.

Not long ago, the Dog Officer in Bennington, Vt., wrote Neuwald for a smell he could put on his clothes that would attract dogs. Neuwald sent some "sausage" smells. A week later, the Vermonter wrote back: "The smells made dogs interested in me, but they size me up, think I'm too big a sausage, and run away!"

There are security odors. "Practically no one dislikes vanilla—it spells security," says Robert Swaine of the Arthur D. Little Co. "At home, when you inhale the smells of coffee or baking, you also inhale security. Memory patterns are always operating."

Smells for the future. Experiments are under way with a wide range of products. For anglers, the Animal Trap Co. of Lititz, Pa., is testing a new fish hook with a built-in odor of rye bread. Another firm has been trying a melon odor for a flytrap. Some doctors have talked about "odor therapy" for hospitals. Recovery of a Southerner, for example, might be hastened by scents of honeysuckle or hot biscuits sprayed around the room.

The potentials of this new industry are literally breathtaking. "I foresee the day," Swaine predicts, "when non-aroma will be unacceptable. Homes, planes, trains, boats will all have a pleasant positive aroma. Raw materials will entrap perfumes for the entire life of the products. Even shoelaces will have odors added."

Already, scent chemists have been asked to figure out how to impart desirable odors inside a spaceship, so that passengers can beat the boredom of the long trip to the moon or elsewhere. Recommended: low-level odors of pine forests and hay fields.

There's no telling what the scent makers will come up with next. ■ ■

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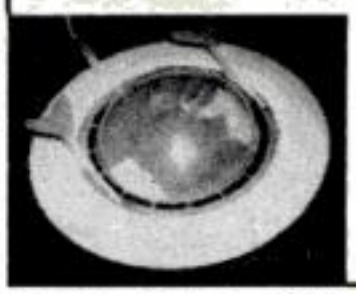

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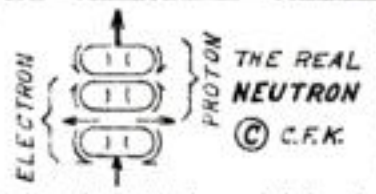

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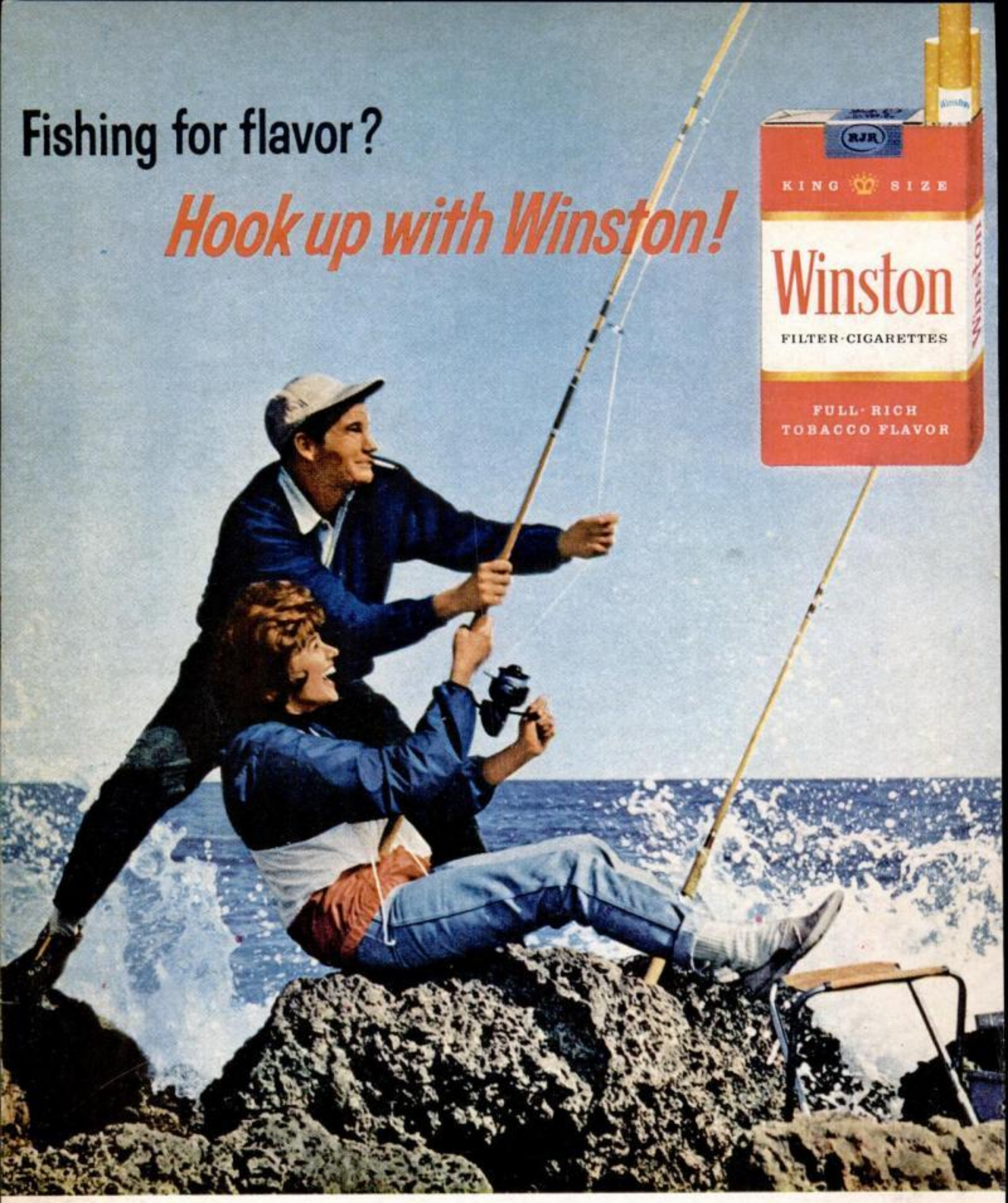

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